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The
Waterproofing
HAND BOOK
1915
SECOND EDITION





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THE *building* WATERPROOFING HANDBOOK *materials*

processes
preservation

*Describing primarily effective and economical methods
for Waterproofing concrete and all forms of masonry
both above and below grade; for preserving decorative
effects, exterior and interior; for protecting finished sur-
faces, whether wood, plaster, concrete or metal, against
water, wear and stains—with*

GF Waterproofing Products and Technical Paints



Trade Mark
Reg. U. S. Pat. Off.

The General Fireproofing Co. YOUNGSTOWN, OHIO

CHICAGO OFFICE	-	-	-	-	325 W. Madison Street
EXPORT OFFICE	-	-	-	-	395 Broadway, New York
LONDON OFFICE	-	-	-	-	34-36 Gresham St., E. C.

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The General Fireproofing Company*

New Waterproofing Standards with Products

WHEN waterproofing was first introduced to the building public so little was known of its true nature that one method or one material was considered applicable to all waterproofing problems.

Its development, however, proves the necessity for many methods and many materials, each suited to a special class of construction and most satisfactory for that particular work.

This fact has been given due consideration in the manufacture of GF Waterproofing Products, described in this book. They are sold entirely on a service basis. While the materials themselves are unexcelled, they will not be thus exploited. Rather will the various waterproofing problems be considered, correct methods recommended and the proper materials suggested to fit the individual case.

Particular attention is directed to the Specification Guide (pages 4 to 9) which indexes this Handbook in just that manner—typical problems and conditions first, methods second, materials third, with the page upon which complete specifications are given, opposite. A study of the Guide and specifications referred to makes clear the correct procedure for most construction or reconstruction work.

The GF Waterproofing Service Department has, in addition, a great amount of information collected from sources of recognized authority and from experience on numerous waterproofing jobs. This material is yours to use in solving any waterproofing problems that may come up. Feel free to request help on specific questions at any time.

The General Fireproofing Company
Youngstown, Ohio

Specification Guide

Substructural Waterproofing

Conditions	METHODS	Materials	Page
Seepage and Natural Soil Drainage, Dampproofing	Protect all masonry coming in contact with earth, with: (a) Bituminous Brush Coating. (b) Bituminous Trowel Coating. (c) Mop Coating applied hot. (d) Waterproofed Cement Plaster. (e) If mass concrete, incorporate Waterproofing throughout mass. (f) If brick, stone or vitrified tile, incorporate Waterproofing in mortar for all joints.	GF No. 16 GF No. 15 GF No. 17 GF No. 10 GF No. 10	50 52 30 14 13
Heavy Pressure in Conjunction with a Drainage System, Waterproofing	1. Waterproof by the integral method either as: (a) Waterproofed cement plaster inside or outside and under walls and over or under floors. (b) Incorporate Waterproofing throughout mass of concrete. (c) Incorporate Waterproofing in mortar for all joints of brick, stone or vitrified tile. 2. Envelop entire substructure with a waterproofed envelope. (a) Bituminous Trowel Coating (b) Reinforced Bituminous Mat (Bitumen and Wool Felt). (c) Reinforced Bituminous Mat (Bitumen and Saturated Fabric).	GF No. 10 GF No. 10 GF No. 10 GF No. 15 GF Nos. 17-18 GF Nos. 20-21	16 13 22 52 32 42
Heavy Pressure Without Installing Drainage System, Waterproofing	1. Envelop entire substructure in a heavy reinforced Bituminous Mat. (a) Bitumen and Wool Felt. (b) Bitumen and Saturated Fabric. 2. Waterproof by Integral method as: (a) Incorporate Waterproofing throughout entire mass of concrete for walls and floors. (b) Waterproofed cement plaster applied outside and under walls or on the inside of walls, and under or as the top finish of floors. (c) Integral Waterproofing incorporated in mortar for all joints of brick, stone or vitrified tile.	GF Nos. 17-18 GF Nos. 20-21 GF No. 10 GF No. 10 GF No. 10	33 42 13 14 22

Specification Guide (Continued)

Conditions	METHODS	Materials	Page
Leaky Base-ments, Pits, Cisterns, Tanks, Swimming Pools, Etc.,	1. Apply a Reinforced Bituminous Mat to floors and side walls protecting the floor waterproofing with reinforced concrete, and the wall waterproofing with masonry (either reinforced concrete or brick):		
Repairing	(a) Bitumen and Wool Felt. (b) Bitumen and Saturated Fabric.	GF Nos. 17-18 GF Nos. 20-21	34 43
	2. Install a waterproofed reinforced floor slab and plaster wall surface with waterproofed cement mortar.	GF No. 10	17
Break or Opening in Surface Integrally Waterproofed, Repairing.	Fill with waterproofed mortar.	GF No. 10	23
Swimming Pool to be Water-proofed against Inside Pressure	1. Waterproofed plaster coat on the inside. 2. Waterproofing integrated throughout concrete. 3. Reinforced Bituminous Mat on the inside: Bitumen and Saturated Fabric.	GF No. 10 GF No. 10 GF Nos. 20-21	24 24 47
	4. Coat with colorless Water-proofing on inside.	GF No. 100	63
	5. To obtain an even, pleasing color inside use	GF No. 101	65
	6. Coat with a bitumistic troweling compound; cover with mortar coat, enamel tile or brick.	GF No. 15	52
	7. Coat with a bitumistic brush coating; cover with mortar coat, enamel tile or brick.	GF No. 16	51
Swimming Pool to be Water-proofed against Inside and Outside Pressure	1. Waterproofed plaster coat on the inside. 2. Waterproofing integrated throughout concrete. 3. Reinforced Bituminous Mat in center of wall and floor: Bitumen and Saturated Fabric.	GF No. 10 GF No. 10 GF Nos. 20-21	24 13 47

Dampproofing Above Grade

Conditions	METHODS	Materials	Page
Exterior Walls to be Dampproofed on Inside	1. Coat the interior face of exposed walls with a Dampproofing Coating.	GF No. 200	58

Specification Guide (*Continued*)

Conditions	METHODS	Materials	Page
(1) Plaster Applied Direct to Wall	2. For sealing angle, between ceiling and side wall. 3. Scratch coat of mortar to have Integral Waterproofing incorporated.	GF No. 15 GF No. 10	53 20
(2) In Connection with Furring	1. Coat entire interior face of exterior walls. 2. Trowel a plastic coating over entire interior face of exposed walls. 3. Seal angle between ceiling and side walls. 4. Apply coat of Waterproofed Portland Cement Mortar on interior face of exterior wall. 5. When Porous Corrugated Tile construction is used, apply Damp-proofing Coating before plastering.	GF No. 200 GF No. 15 GF No. 15 GF No. 10 GF No. 200	58 53 53 20 58
Stucco Applied over Trussit or Self-Sentering	1. Waterproofing incorporated with stucco coat. 2. Colorless Waterproofing Coating. 3. Coating to obtain a uniform, pleasing color.	GF No. 10 GF No. 100 GF No. 101	20 61 65
Concrete, Brick, Stucco or other masonry	1. Waterproofing incorporated throughout mass of concrete. 2. Waterproofing incorporated throughout stucco coat.	GF No. 10 GF No. 10	13 20
(1) Dampproofed without Affecting Color or Texture	3. Waterproofing incorporated throughout mortar used for laying brick or stone. 4. Coating concrete, brick, stucco or tile, so that neither color nor texture is changed. 5. Coat with Acid and Waterproof Coating.	GF No. 10 GF No. 100 GF No. 99	22 61 73
(2) Dampproofed and Beautified Parapet Walls and Copings	Coat exterior surface with 1. Plaster on inner side of parapet wall below coping. (a) Bituminous Trowel Coating. (b) Colored, flexible material. (c) Waterproofed Cement Mortar.	GF No. 101 GF No. 15 GF No. 250 GF No. 10	65 53 67 20
Dampproofed	2. Coat inside and outside of parapet with Colorless Waterproofing. 3. Coat walls to obtain a uniform color. 4. Imbed masonry and copings in waterproofed mortar.	GF No. 100 GF No. 101 GF No. 10	62 65 22
Leaky Brick, Stucco or Concrete Walls, Repairing	1. Coat walls with Colorless Waterproofing. 2. Coat walls with colored coating to obtain desired color, Damp-proofing at the same operation.	GF No. 100 GF No. 101	61 65

Specification Guide (Continued)

Conditions	METHODS	Materials	Page
Salt Exuding Wall, Remedying	3. Where brick is soft and joints poor:		
	(a) Apply waterproofed plaster.	GF No. 10	20
	(b) Apply a flexible colored Trowel Coating.	GF No. 250	67
	Coat with Colorless Waterproofing.	GF No. 100	62

Waterproofing Containers

Conditions	METHODS	Materials	Page
Silos, Water Tanks, Troughs, Etc., Waterproofing	1. Apply waterproofed plaster coat inside, or outside and inside.	GF Nos. 10-11	24
	2. Coat interior surface with Colorless Waterproofing.	GF No. 100	61
	3. To make surface of tanks even and pleasing in color, coat interior with	GF No. 101	65
Protecting Tanks against Dilute Acids	1. Coat with	GF No. 99	73
	2. Swab interior of tank with hot Bitumen.	GF No. 17	30

Stainproofing

Conditions	METHODS	Materials	Page
Tile Set with Patent Plaster	Coat surface of porous tile with Stainproof Coating before applying plaster.	GF No. 200	58
Limestone, Marble, Etc.	1. Coat back and sides of stone with Stainproof and Waterproof Coating.	GF No. 220	55
	2. Protect face of stone with Colorless Coating.	GF No. 145	70
Concrete and Composition Floors	Apply three coats of	GF No. 99	73

Floor Waterproofing

Conditions	METHODS	Materials	Page
Mills, Garages, Stables, Etc.	1. Wood floors of stables, mills, etc., waterproof with:		
	(a) Bituminous Trowel Coating.	GF No. 15	53
	(b) Reinforced Bituminous Mat (Bitumen and Wool Felt).	GF Nos. 17-18	36
	(c) Reinforced Bituminous Mat (Bitumen and Saturated Fabric).	GF Nos. 20-21	45
	2. Concrete floors of garages, mills, bathrooms, etc. waterproof with:		

Specification Guide (Continued)

Conditions	METHODS	Materials	Page
	(a) Reinforced Bituminous Mat (Bitumen and Wool Felt).	GF Nos. 17-18	36
	(b) Reinforced Bituminous Mat (Bitumen and Saturated Fabric).	GF Nos. 20-21	46
	(c) Incorporate Waterproofing throughout floor construction.	GF No. 10	13
	(d) Incorporate Waterproofing throughout wearing surface.	GF No. 10	17
	3. Waterproof superficial wearing surface:		
	(a) With a colorless coating.	GF No. 100	61
	(b) With a coating that will give an even, pleasing color.	GF Nos. 150-151	75
	4. Water and acid-proof superficial wearing surface.	GF No. 99	73

Roof Waterproofing

Conditions	METHODS	Materials	Page
Flat Roof	1. (a) Built up roof over boards. (b) Built up roof over concrete. (c) Flexible Trowel Coating.	GF Nos. 17-18 GF No. 17-18 GF No. 250	35 35 68
Flat Tile Roof	1. Waterproofing beneath tile: (a) Bituminous Trowel Coating. (b) Heavy Reinforced Bituminous Mat (Bitumen and Wool Felt). (c) Heavy Reinforced Bituminous Mat (Bitumen and Saturated Fabric). (d) Waterproofed mortar incorporated in joints of tile.	GF No. 15 GF Nos. 17-18 GF Nos. 20-21	54 35 45
Pitch Roof	1. Waterproof with Plastic Trowel Coating. 2. Waterproofing Tile: (a) Waterproofing incorporated throughout mortar joints. (b) Trowel Coating troweled in the joints.	GF No. 10 GF No. 250 GF No. 10 GF No. 250	22 68 22 68

Bridge Waterproofing

Conditions	METHODS	Materials	Page
Railway Bridge (Steel Trough, Steel or Concrete Deck)	1. Install heavy Reinforced Bituminous Mat. (a) Bitumen and Wool Felt. (b) Bitumen and Saturated Fabric.	GF Nos. 17-18 GF Nos. 20-21	37 47

Specification Guide (Continued)

Conditions	METHODS	Materials	Page
Road Bridge	1. Install heavy Reinforced Bituminous mat.		
	(a) Bitumen and Wool Felt. (b) Bitumen and Saturated Fabric.	GF Nos. 17-18 GF Nos. 20-21	37 47

Cement Floors—Dustproofing, Hardening and Finishing

Conditions	METHODS	Materials	Page
New Floors	Dustproofed by applying drying coat of Hardener.	GF No. 140	69
Old Floors	1. Impregnating compound to dustproof and still retain original color and texture.	GF No. 145	71
	2. Dustproofing by applying colored flat or gloss finish coating.	GF Nos. 150-151	75

Decorating Interior Walls

Conditions	METHODS	Materials	Page
Plastered Surfaces Decorated and made Sanitary	1. Paint surfaces with water repelling and resisting coating.	GF Nos. 499-500	78
	2. Paint concrete, brick, tile or plastered surface with Waterproofing Coating.	GF No. 101	65
Plaster, Concrete and Brick Surface—Acid Proofing	1. Paint surface with Acid-proof Coating.	GF No. 99	73
	2. Paint surfaces already decorated with Acid-proof Coating.	GF No. 99	73

Protective Coatings for Steel, Galvanized Iron, etc.

Conditions	METHODS	Materials	Page
Steel in Contact with Masonry	Apply to surface of steel a rust-resisting coating, protected with an alkali-resisting coating.	GF Nos. 300-325	79
Steel Exposed to Atmosphere	Apply to surface a rust-resisting coating. (Two coats.)	GF No. 300	79
Galvanized Iron	Apply to surface a strongly adhesive Rust-resisting Coating.	GF No. 350	82



FULLERTON-WEAVER APARTMENT HOUSE—635 Park Ave., New York City
Architect—J. E. R. Carpenter. Contractor—Fullerton-Weaver Construction Co.
Basement waterproofed with GF No. 10 Integral Waterproofing Paste

The Integral Method of Waterproofing

GF No. 10—Integral Waterproofing Paste

By the Integral Method of waterproofing is meant the incorporation of a waterproof material into the voids of the concrete or mortar, during the process of mixing. This is the simplest and, with the proper materials, the most economical type for it is possible to meet a great many waterproofing problems by the Integral Method and there is little opportunity for improper application.

Any integral waterproofing, however, to be effective must be completely distributed throughout the mortar or concrete. And unless it goes into permanent chemical combination there is danger of its being eventually washed out or absorbed with the consequent loss of all waterproofing value.

GF No. 10 is a smooth white Waterproofing Paste which is first dissolved in the gauging water and then carried into every void in the mixture that the water itself penetrates. It remains dissolved permanently so that gauging water and paste when once thoroughly combined can be used at any time without further attention.

Upon contact with the constituents of cement GF No. 10 forms a chemical compound which hardens in all the minute voids into a stable, water-repelling mass.

In some cases where integral waterproofing is used the materials for waterproofing effect the "set" of the concrete or mortar even to the extent of weakening or softening the mass. There is a set corrective agent in GF No. 10 which neutralizes all harmful action of this kind and allows concrete impregnated with GF Integral Waterproofing Paste to set exactly as it would under ordinary conditions. Tests prove also that neither the tensile nor compressive strength is materially affected by waterproofing with GF No. 10.

Briefly the value of GF No. 10 Paste for Integral Waterproofing is made up by these three features.

First. Its absolute solubility in water, insuring uniform distribution throughout the mass.

Second. Its chemical combination with cement to form a perfect and permanent waterproofing.

Third. The simplicity of its application—reducing labor cost and eliminating imperfections due to careless workmanship.

A Test of GF No. 10

The waterproofing value of GF No. 10 Integral Waterproofing Paste is well evidenced in the following letter from Robert W. Hunt & Co., of Chicago, giving the results of a test conducted on this material.

ROBERT W. HUNT & CO., ENGINEERS

The General Fireproofing Company,
Youngstown, Ohio.
Gentlemen:

Chicago, March 5, 1914

The following is a report of our construction and tests of a certain 18 in. concrete cube made with the addition of "GF No. 10 Integral Paste."

Construction of Cube with GF No. 10 Integral Paste

Under date of January 14th, we constructed a cube of concrete 18 in. square with a 2 in. pipe embedded in the center of it to a depth of 12 in.

This cube was made from a mixture of one part of Portland cement to two parts of Torpedo sand to four parts of crushed limestone ($\frac{3}{4}$ in. and under). In the mixing of the concrete the amount of water used was approximately 10 per cent of the total weight of the mixture. To the water had been added an amount of "GF No. 10 Integral Paste," which gave the equivalent of 17 pounds of "GF No. 10 Integral Paste" to a finished cubic yard of concrete.

Test of Tube

After aging 28 days in air, a city water pressure of approximately 18 pounds per square inch was applied into the pipe for a continuous period of 15 days. During this period and under these conditions the cube did not show any signs of dampness whatsoever.

The cube was then subjected to an increase of pressure by means of a hydraulic pump as indicated in the tabulation below and which constitutes a log of the tests.

Log of Test

Pressure applied, pounds per sq. in.	Length of time pressure maintained, minutes	Observations
100	5	With no leaks whatsoever
200	5	With no leaks whatsoever
300	5	With no leaks whatsoever
400	5	With no leaks whatsoever
500	5	With no leaks whatsoever
600	5	With no leaks whatsoever
700	5	With no leaks whatsoever
800	5	With no leaks whatsoever
900	5	With no leaks whatsoever
1000	5	With no leaks whatsoever
1100	5	Base of cube opposite open end of pipe sweating at two locations.
1200	5	Base of cube dripping slowly at two locations and a third.
1300	5	Base of cube dripping slowly at three locations and a fourth one.
1400	5	Base of cube dripping slowly at ten locations.
1500	5	Base of cube dripping slowly from thirteen locations.
1600	?	It was impossible to hold 1600 pounds pressure on account of the dripping.

By rapid pumping a pressure of 1800 to 2000 lbs. per square inch was held for one minute when the pressure dropped suddenly to from 1200 to 1400 lbs. per square inch; it was held there approximately 4 minutes when the cube ruptured on two sides and the bottom. The sides of the cube did not show any signs of dampness up to the final failure. The top side showed dripping at five places near the pipe, probably due to the water backing up to the pipe and the surrounding concrete. The first of these leaks showed under the 1100 lbs. pressure.

Respectfully submitted,

ROBERT W. HUNT & CO.

General Directions and Quantities Required

When the amount of cement to be used in the mix which is to be waterproofed has been determined, add to the water to be used in making this batch of concrete or plaster two per cent by weight of the cement of GF No. 10 Integral Waterproofing Paste. In other words, two pounds of GF No. 10 for every bag, or eight pounds for every barrel of cement used in making the mix. This is to be stirred into the water until it has thoroughly dissolved so that the water is of an even, milky color.

GF No. 10 Paste weighs eight pounds to the gallon and water weighs eight pounds to the gallon. As it is the accepted custom to use about 34 gallons of water for each barrel of cement used in making a batch of mass concrete to be poured, the proportion of paste to water would be 1-34. As there is usually about 17 gallons of water used to each barrel of cement in a batch of mortar for plaster coat work, the proportion of GF Paste to water would be 1-17.

After the paste has once been brought into solution or thoroughly dissolved in the water by stirring, no further attention is necessary as the paste will maintain a perfectly even distribution throughout this water indefinitely.

The cement mortar or concrete is to be wet, gauged or tempered with the milky solution thus obtained and the result will be, when the concrete has set, an absolutely water-tight mass.

Specifications for Waterproofing with GF No. 10 Integral Waterproofing Paste

Materials

1. Waterproofing:

GF No. 10 Integral Waterproofing Paste as manufactured by The General Fireproofing Company, Youngstown, Ohio, is to be purchased direct from them or their authorized Agents. The paste must be brought to the building site in original and sealed packages. This paste must be used without adulteration and in accordance with the manufacturer's specifications and directions.

GF No. 10 Integral Waterproofing Paste is to be added to all water used in mixing the mortar in the amount of 2% by weight of the cement.

2. Cement:

All cement shall be a high grade Portland Cement meeting satisfactorily the requirements of the Standard Specifications of the American Society for Testing Materials. It shall preferably be so ground that eighty per cent (80%) shall pass a Standard Two Hundred (200) Mesh sieve.

3. Sand:

All sand shall be absolutely free from loam, clay, vegetable or other deleterious organic matter and uniformly graded from coarse to fine in size.

4. Draining:

Before actual waterproofing can be commenced it is necessary to drain away from the surfaces to be waterproofed any water which may be present. Provision must be made to keep this water out during the process and until the last section of Waterproofing is thoroughly set.

Entire Body of Concrete to be Waterproofed

General: Sections 1 to 4 to be carefully followed, and—

5. Materials:

All concrete used in the (name part of work) is to be mixed in the proportions of one part cement, two parts sand and four parts aggregate. Or one part cement, two and a half parts sand to five parts aggregate.

6. Mixing:

A dry mixture of cement, sand and stone is to be made, preferably of the proportion 1:2:4 or 1:2½:5, which shall be tempered with water to a quaking consistency to

Specifications—Continued

which water there has been added GF No. 10 Integral Waterproofing Paste so that the proportion shall be 8 pounds of paste to each barrel of cement or 2 pounds of paste to each bag of cement.

7. Placing:

All concrete is to be placed in one continuous operation where possible. Each pouring is to be thoroughly spaded to insure uniform density in the wall or floor.

8. Necessary Joints of New to Old Work:

Where joints are absolutely unavoidable the old surface must be roughened and cleaned.

This old surface is to be thoroughly hacked or chipped using if necessary a regular mason's chipping hammer. Then the surface is to be thoroughly wire brushed.

After this has been done the face of the joint is to be treated with a solution made of 2 pounds of GF No. 400 Bonding Compound dissolved in a gallon of water. This solution is to be applied to the surface with a corn broom or acid brush. After all chemical action has ceased the surface is to be thoroughly washed with clean water, using a hose if possible.

While the surface of the concrete is still wet, a thin cream of cement and water (the water is to have in it GF No. 10 Integral Waterproofing Paste) is to be applied and the new concrete immediately poured or laid in place.

9. Curing:

The work is to be allowed to cure the ordinary length of time before the forms are removed as GF No. 10 Integral Waterproofing Paste is so compounded that it neither accelerates nor retards the set of cement.

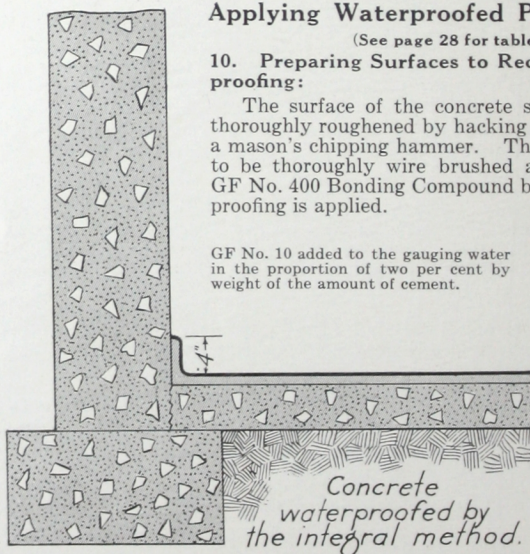
Applying Waterproofed Plaster Coats

(See page 28 for table)

10. Preparing Surfaces to Receive Waterproofing:

The surface of the concrete side wall is to be thoroughly roughened by hacking or chipping with a mason's chipping hammer. Then this surface is to be thoroughly wire brushed and treated with GF No. 400 Bonding Compound before any Waterproofing is applied.

GF No. 10 added to the gauging water in the proportion of two per cent by weight of the amount of cement.



Two pounds of GF No. 400 are to be dissolved in a gallon of water and this solution applied to the surface with a corn broom or acid brush. This material is to be well rubbed in. After all chemical action has ceased, the wall is to be thoroughly washed, if possible with a hose, to remove surplus material.

Before any Waterproofing is applied over the floors they must be cleaned of all grease, dirt and foreign matter, using if necessary wire brushes for this purpose.

Specifications—Continued

11. Saturation:

All masonry surfaces are to be saturated with as much water as they will absorb before applying the cement grout necessary for holding the first waterproofed plaster coat.

12. Preparing Brick or Stone Walls:

The joints of the brick work should be raked out at least $\frac{3}{8}$ of an inch and then brushed with a wire brush to remove loose particles of mortar.

After this has been done the whole wall is to be thoroughly saturated with water to the point where it will absorb no more. Then the coat of cement grout may be applied.

In rubble stone walls the joints are to be thoroughly raked out to a depth of $\frac{3}{8}$ " to $\frac{1}{2}$ " and the wall thoroughly saturated with water before any waterproofing coat is applied.

13. Materials:

The cement grout is to be neat cement made of such consistency that it may be applied to the surface with a brush.

The mortar for waterproofed plaster coat is to be mixed of never less than one part cement to two parts sand, nor more than one part cement to two and a half parts sand. GF No. 10 Integral Waterproofing Paste is to be added to the gauging water in the amount of 2 per cent by weight of amount of cement used in mixing each batch of mortar.

14. Mixing and Quantities:

The cement and sand are to be thoroughly mixed together, turning over the mass at least three times. Then the water used for tempering this mass, in which has already been dissolved the GF No. 10 Integral Waterproofing Paste, is to be added and the mixture thoroughly turned over until it is of even consistency.

The same mixture and proportions are to be used for both coats.

15. Application:

After the wall has been roughened, treated with GF No. 400 Bonding Compound, well saturated with water and while the surface is still wet, apply the neat cement grout with a brush, and immediately thereafter apply the first coat of waterproofed plaster onto the wall. The plaster shall be extended down into the gutter at the foot of the wall. This coat should be about $\frac{3}{8}$ of an inch thick and after it has obtained sufficient set, is to be thoroughly scratched to afford a key for the second coat.

This scratch coat is to be allowed to set for 12 hours or more until it is of sufficient strength to carry the second coat.

After the necessary time has elapsed the scratch coat should be treated with a wash of neat cement of the same proportion as before. Then the second coat of waterproof mortar should be applied thereto and floated free from all imperfections, using in this process the greatest pressure it is possible for the workman to apply. Then the surface is to be finished to a smooth, even texture with a steel trowel.

Do not trowel the surface of the cement in the gutter if a waterproof coat is to be put over the floor as it is necessary to leave this surface rough to afford a key or bond to the floor waterproofing. In case there is to be no waterproof coat over the floor, the mortar in this gutter is to be brought up even with the original level of the floor and trowelled to a smooth and even surface.

(Note: In case it is unnecessary to apply a waterproof plaster coat over the entire surface of the floor, a narrow gutter $2\frac{1}{2}$ inches by 3 inches should be cut down into the floor close up to the side wall, treated in the same manner as the side wall and filled with plaster which is to be trowelled out and up to an even surface with the surrounding flooring.)

The total thickness of the two coats applied to the wall should not exceed $\frac{3}{4}$ of an inch.

16. Caution:

All pipes or other conduits going through this wall should be painted thoroughly with a coat of GF No. 16 before the waterproof plaster coat is applied.

Specifications—Continued

17. Top Finish over Floor:

After all traces of grease, dirt and other foreign matter have been carefully removed the surface of the floor is to be thoroughly wetted and a coat of neat cement applied thereto.

The plaster coat 3" up the side wall from the angle of the side wall and floor should be roughened and treated with Bonding Compound for the reception of the floor waterproofing so as to obtain a perfect bond and tight joint at this point.

The waterproofing over the floors should be carried up this side wall waterproofing in the shape of a coved base for a distance of about 6" to assure a perfect joint.

All encumbrances upon the floor that cannot be removed should be prepared with GF No. 16 to form a flexible joining with the waterproof coat over the floor.

The waterproof mortar is to be applied in one coat to a thickness of (this thickness must be such that the weight of the concrete or the strength of it, if reinforced, will overcome the estimated hydro-static head over the entire surface of the floor, through the gutter and up the side wall in the form of a base about 6" above the general level of the floor).

After this mortar has obtained sufficient set, it is to be floated free from all imperfections and trowelled smooth with a steel trowel. In the course of this floating and in the trowelling as much pressure as possible must be exerted to finish the surface free from all imperfections.

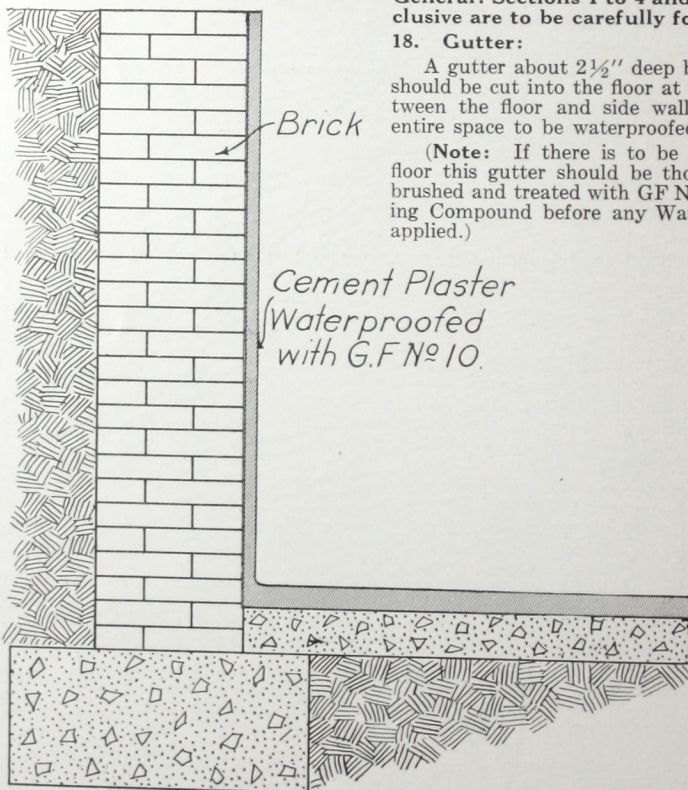
Plaster Coat Applied on the Inner Face of Walls and over Floors

General: Sections 1 to 4 and 10 to 17 inclusive are to be carefully followed, and

18. Gutter:

A gutter about $2\frac{1}{2}$ " deep by $3\frac{1}{2}$ " wide should be cut into the floor at the angle between the floor and side wall around the entire space to be waterproofed.

(Note: If there is to be no coat over floor this gutter should be thoroughly wire brushed and treated with GF No. 400 Bonding Compound before any Waterproofing is applied.)



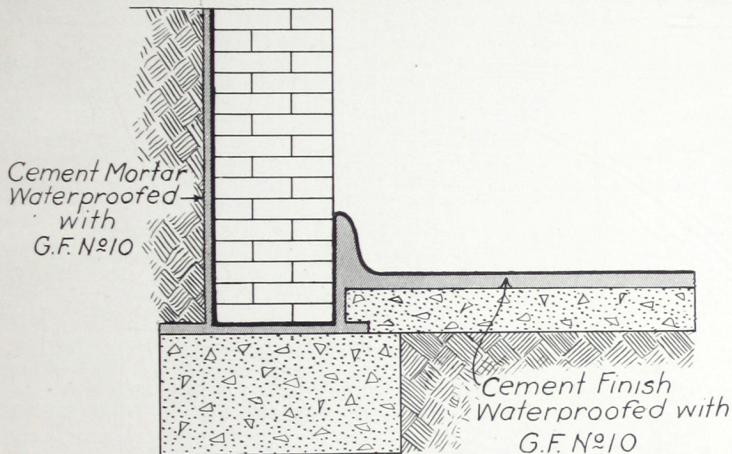
Specifications—Continued

Plaster Coat Applied on Outer Face of and Under Walls and Over or Under Top of Floors

General: Sections 1 to 4 and 10 to 17 inclusive are to be carefully followed, and—

19. Treatment of Footings:

After the footings have been set in place and while they are still green, a 1" coat of waterproofed mortar shall be plastered over the top of them. This waterproof coat shall be carried either side of the wall line at least 6".



20. Treatment of Walls:

After the side wall has been set in place, roughened, treated with Bonding Compound and saturated and while the surface is wet, apply neat cement grout with a brush and immediately plaster the first coat of waterproofed plaster onto the wall from the top of the footing to 1 to 3 inches above grade. This first coat should be about $\frac{3}{8}$ of an inch thick and after it has obtained sufficient set, is to be thoroughly scratched to afford a key for the second coat.

21. Back Fill:

After the second coat of waterproofed mortar has been applied and thoroughly trowelled up, the back fill may be made directly against this plaster coat.

22. Joint at Floor:

Before the concrete floor is set on the inside of the wall a plaster coat applied as specified for the outside of the wall should be carried down from the top of the footing to a point even with the surface of the finished floor inside.

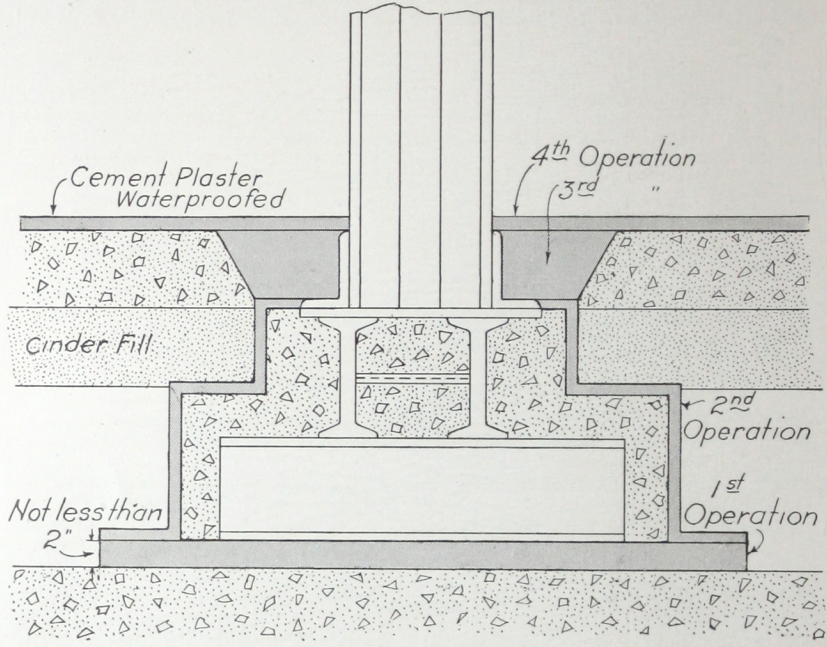
Repairing Leaks in Walls and Floors and for Waterproofing Leaky Basement Walls and Floors

General: Sections 1 to 4 and 10 to 17 inclusive are to be carefully followed, and—

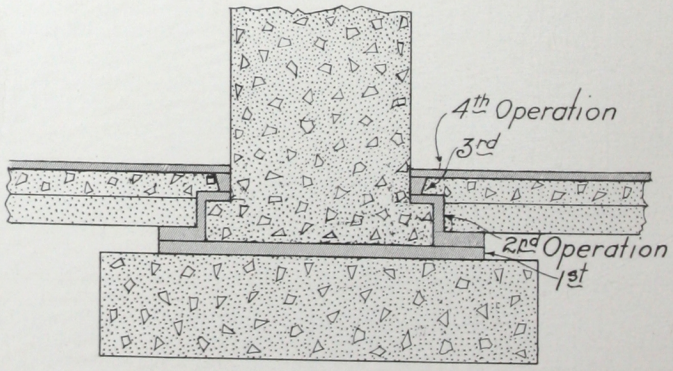
23. Where it is Possible Remove the Pressure and Water from the Outside of the Wall:

Where it is possible to have access to outer side of wall to be waterproofed a trench should be dug around all walls, this trench to go down as low as the footing course. This trench is to be pitched to a hole or ditch from which the water may be rapidly drained, so as to absolutely remove all pressure from walls and floor to be waterproofed.

System of Waterproofing Column Footings With GF No. 10



Waterproofing Steel Column Footing and Grillage with GF No. 10



Waterproofing Footing for Concrete Column with GF No. 10. Above methods used in Ward Bakery Building, Orange, N. J.

Specifications—Continued

All water pressure and all water must be kept away until the Waterproofing has set. After the Waterproofing has set thoroughly, the ditch and well or pit should be filled with broken stone or porous drain tile so as to leave them in condition to continue to relieve the pressure. After this has been done the back fill of dirt may be made.

24. Draining Walls and Floors from the Inside to Relieve Water Pressure:

Around inside of all outside walls dig a trench, leading this trench to a sump pit or hole from which provision must be made to eject all water. The trench to be of sufficient width and depth to carry the volume of water coming through the walls and floors to the sump pit. This trench to be so designed that the upper level of the water is to be below the under side of the concrete underbed.

The bottom of the trench to be filled with broken stone or to have porous drain tile installed therein. The stone or tile to be covered with a layer of tarred felt or paper to prevent the subsequent layers of concrete from clogging the drain.

25. Bleeding Walls:

Where a pressure is encountered on side walls which are to be covered on the inside with a plaster coat of waterproofed mortar, it may be necessary to bleed these walls with pipe drills. These "bleeders" are to be set at such intervals as to relieve all water pressure.

(Note: In case this condition is encountered it would be well to write The General Fireproofing Company, Youngstown, Ohio, for a complete set of specifications for the individual job in hand. It is impossible to cover this condition with a general specification.)

In asking for information it is necessary to give The General Fireproofing Company all data as to water pressure encountered, height, length and thickness of surface to be waterproofed and the amount of space available for doing this work. All this data is necessary if you are to get an intelligent specification and, possibly, a drawing showing the layout of the "bleeders."

26. Installing Pipe and Flange in Sump Hole:

The sump is to be of sufficient depth to keep the water level at the point farthest from this sump hole below the concrete slab present or to be installed. This sump hole is to be equipped with an unpainted cast-iron pipe of sufficient diameter to take the suction pipe of the pump to be connected. The pipe installed is to have an iron flange at one end, with four holes with four 4-inch iron bolts through the holes, the object of these bolts being to hold the flange in place and prevent it from twisting and turning. The top end of the pipe to be threaded to take an iron cap which is to be placed in position when the process of waterproofing is completed. This pipe is to be set in the center of the sump hole, so that the top of the cap will be 1 inch below the surface of the concrete floor slab when same is finished. The bottom of this sump hole is to be filled with broken stone which is to be brought to a level to support the flange.

27. Freeing Sump Holes of Water:

In cases where the sump hole is to be left open, provision must be made for keeping it free of water, either by an automatic ejector or a steam pump.

Where the sump pit is to be closed up permanently and not left open for drainage purposes, the procedure is to be as follows:

28. Finishing over Sump Hole:

After the floor waterproofing has thoroughly set, the suction pipe is to be removed from the sump hole, the cap screwed over the pipe set therein and the hole filled up with waterproofed mortar.

Boards or planks are to be laid over this mortar and thoroughly weighted or braced to keep them and the mortar in position until it has thoroughly set.

29. Sump Hole Left Open:

If the sump hole is to be left open for drainage purposes, the top finish over the floor is to be brought up to the edge of the sump and finished off with a rim which is to be made of size to fit some type of cover for the sump hole.

Specifications—Continued

Stucco Applied to the Outside or Cement Mortar Plaster Applied to Inside of Porous Terra Cotta Tile, Brick, Vitrified Tile or Face Brick Walls

General: Sections 1 to 4, 14 and 16 are to be carefully followed, and—
Preparing surfaces to receive waterproofing

30. Common Brick Wall:

The joints of the brick work should be raked out at least $\frac{3}{8}$ of an inch and then brushed with a wire brush to remove loose particles of mortar.

After this has been done the whole wall is to be thoroughly saturated with water to the point where it will absorb no more.

31. Porous Terra Cotta Tile:

Where tile are especially ribbed or keyed for holding plaster it is only necessary to saturate thoroughly before the waterproofed mortar is applied.

32. Vitrified Tile:

The joints of all walls of vitrified tile are to be raked out about $\frac{3}{8}$ of an inch and the surface of the tile thoroughly chipped with a mason's chipping hammer before any waterproof coats are applied.

After this has been done the whole wall is to be thoroughly saturated with water to the point where it will absorb no more. Then the coat of cement grout may be applied.

33. Face Brick:

After the mortar joints have been raked out about $\frac{3}{8}$ of an inch it will be necessary to chip the face of the brick themselves if they are very smooth texture, hard burned, or pressed face brick.

After this has been done the whole wall is to be thoroughly saturated with water to the point where it will absorb no more. Then the coat of cement grout may be applied.

34. Materials:

The cement grout is to be neat cement made of such consistency that it may be applied to the surface with a brush.

The mortar for the waterproofed stucco is to be mixed of one part cement to two and a half parts sand. GF No. 10 Integral Waterproofing Paste is to be added to the water used in mixing as specified above.

35. Application:

After the wall has been prepared and saturated and while the surface is still wet, apply the first coat of waterproofed plaster about $\frac{3}{8}$ of an inch thick. After this first coat has set sufficiently it is to be thoroughly scratched to afford a key for the second coat.

This scratch coat is to be allowed to set for 12 hours or more until it is of sufficient strength to carry the second coat.

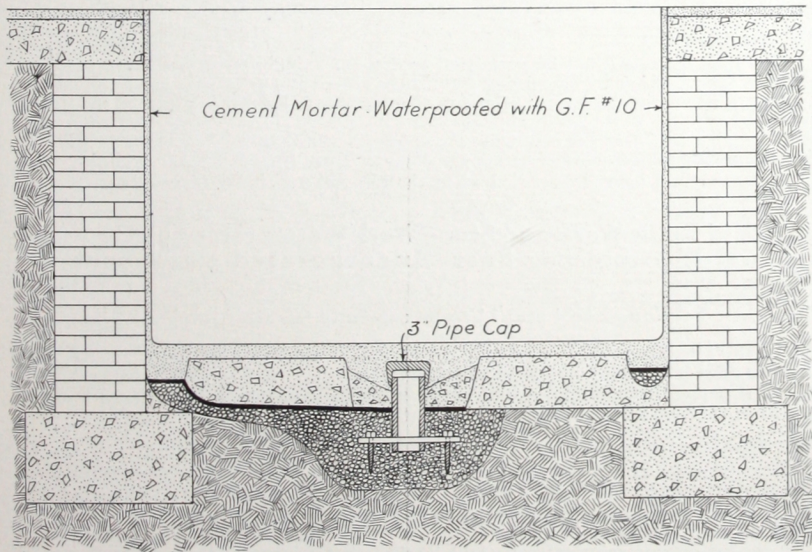
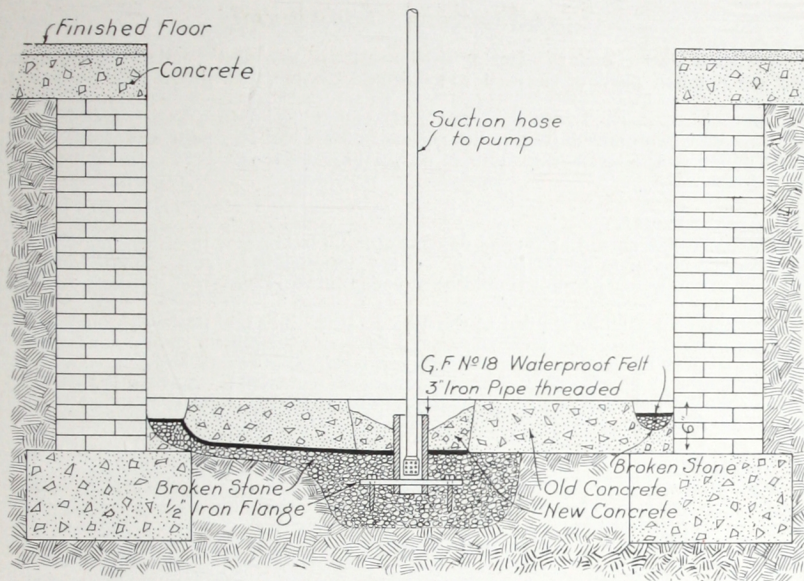
After the necessary time has elapsed the second coat of waterproofed mortar or stucco should be applied and floated free from all imperfections. The surface is to be finished as closely as consistent with the pre-determined surfacing of the stucco.

Waterproofing Stucco to be Applied to Trussit, Self-Sentering or Herringbone Metal Lath

General: Sections 1 to 4 and 14 are to be carefully followed, and—

36. Materials:

The mortar for the scratch coat shall consist of one part Portland Cement to two and one-half parts clean, sharp sand with a small amount of hair ($1\frac{1}{2}$ lbs. hair to each bag of Portland Cement). If lime putty is added it shall not be in excess of $\frac{1}{2}$ of the volume of cement.



Method of Waterproofing Leaky Basements under Heavy Pressure, without permanent Drainage Systems

Specifications—Continued

For back-plaster coat the mortar shall consist of one part Portland Cement to two and one-half parts of clean sharp sand, and GF No. 10 Integral Waterproofing Paste.

The finish coat shall consist of one part cement, two and a half parts of clean sharp sand or two parts of sand and 2 per cent of GF No. 10 Integral Waterproofing Paste added to the tempering water in proportion to the volume of cement used in making the mix.

37. Application:

The plastering should be carried on continuously in one general direction, without allowing the plaster to dry at the edge. If it is impossible to work the full width of the wall at one time, the joint should be at some natural division of the surface, such as a window or door.

The first coat shall be applied to the outside of the lath and pushed through sufficiently to give a good key. Over the face of the studs the plaster shall be forced well through the lath in order to fill entirely the space between the lath and the stud. The backing coat shall be applied to the back of the lath and shall be thoroughly trowelled so that the lath shall be entirely covered. The final coat shall be applied to the face of the first coat.

38. Roughing:

Soon after applying and before the initial set has taken place, the surface of the coats which are to receive succeeding coats shall be roughened with a saw-toothed paddle or other suitable device.

39. Dampening:

Before applying mortar the surface of the preceding coat shall be thoroughly wetted to prevent absorption of water from the fresh mortar.

40. Thickness of Coat:

The first coat shall be at least $\frac{3}{8}$ in. thick over the face of the lath and project through behind the lath about $\frac{3}{8}$ in. The backing coat shall increase the thickness behind the lath to not less than $\frac{5}{8}$ in. The final coat shall be not less than $\frac{3}{8}$ in. thick.

41. Drying Out:

The final coat shall not be permitted to dry out rapidly and adequate precaution shall be taken, either by sprinkling frequently after the mortar has set hard enough to permit it or by hanging wet burlap over the surface to keep the surface of the stucco damp.

42. Freezing:

Stucco should never be applied when the temperature is below freezing.

Joints of Brick Work and Stone Work Waterproofed by GF No. 10 Integral Waterproofing Paste Incorporated throughout the Mortar

General: Sections 1 to 4 and 14 to be carefully followed, and—

43. Material:

The mortar for the joints is to be mixed of one part cement to two parts sand or one part cement to two and a half parts sand. In either case GF No. 10 is to be added to the water used in mixing this mortar as specified above.

44. Mixing:

The cement and sand are to be thoroughly mixed together turning over the mass at least three times. Then the water, in which has already been dissolved the GF No. 10, is to be added and the mixture thoroughly turned over until it is of even consistency.

The Brick or Stone are to be laid in the usual manner except that great care must be taken to see that all beds and joints are full and continuous.

Specifications—Continued

45. Brick Wall:

All brick shall be thoroughly wet just previous to being laid, except in freezing weather, when they shall be thoroughly dry. The brick shall be laid with full beds and joints properly and solidly bounded. No mason work of any description shall be built when the temperature is below 28 degrees F. on a rising temperature or 32 degrees F. on a falling temperature, at the point where the work is in progress. No frozen materials shall be built upon in any case.

46. Stone Wall:

All stone shall be laid on their natural bed. No stone which does not bond or extend into the wall at least six inches shall be used. Stones shall be firmly bedded in mortar of the same mixture as specified for brick walls, and all spaces and joints shall be thoroughly filled with like mortar.

47. Application:

The faces of all these joints must be struck off true with a trowel so as to leave no holes or seams.

Great care must be taken to fill entirely around all pipes, etc., breaking through the wall. In addition all these pipes must be painted with GF No. 200 to form a flexible bond.

48. Flat Tile Roof:

The bed of mortar in which the tile are laid is to be at least 1" thick, made after the proportion hereinbefore specified.

49. Laying Tile:

The tile are to be imbedded in this mortar and trued up, leaving at least a $\frac{3}{8}$ " joint between all tile.

50. Pointing:

The pointing mortar is to be made of the same proportion as that for the bed. The joints must be thoroughly filled and mortar well trowelled down so as to leave no holes or voids.

51. Grouting:

The grout is to be made of the same proportion as above specified, except that additional water, containing GF No. 10 Integral Waterproofing Paste in the proper proportion, is to be used to render the mixture sufficiently liquid to pour into these joints.

All joints shall be filled flush with the surface and the grout be so poured that no air is imprisoned in the joints.

52. Pitch Roof:

The mortar used in pointing the joints of these tile (joints to be not less than $\frac{3}{8}$ " wide) is to be of the same proportions as hereinbefore specified, applied in accordance with directions in section No. 50.

Break or Opening in Surfaces where Concrete is Waterproofed by the Integral Method

(Note: Sometimes a break occurs in a wall or floor that has been waterproofed by the integral method, either in the mass or by a plaster coat, because of the settlement of the building, defective workmanship, the removal or placing of pipes, or external damage.)

53. Large Break or Opening:

In case the break admits either a single large stream or several small streams of water, remove the entire area of the affected surface to a depth of $\frac{3}{4}$ in., leaving the surface rough.

General: Sections 1 to 3, and 10 to 15 inclusive are to be carefully followed, and—

54. Bleeding:

Provide several pieces of $\frac{1}{4}$ inch iron pipe two or three inches in length and drive one piece into the surface wherever water enters, leaving the end projecting about $\frac{1}{4}$ inch beyond the roughened surface. After the pipes are all placed, the water will generally enter only through the pipes.

Specifications—Continued

55. Application:

After the wall is thoroughly saturated and cleaned with GF No. 400 Bonding Compound, apply over the whole of the affected area two coats of Portland Cement Mortar, waterproofed with GF No. 10 Integral Waterproofing Paste as specified, finishing the surface flush with the old adjoining surface.

After this coating has thoroughly set and dried, plug up the ends of the "bleeders" (pipe) with a piece of wood driven in tight. Then cover with cement mortar, connecting this mortar to the adjoining cement coating.

Only two of the "bleeders" are to be plugged daily, working from the outside to the center of the space, allowing sufficient time for the newly applied plaster coating to set hard before closing any more "bleeders." The last "bleeder" is plugged and waterproofed in the same manner as the others and immediately covered with wet straw boards firmly braced and kept so until the plaster coating has set.

56. Small Break or Opening:

If the break is small, clean the surface of all loose particles of cement, dirt, etc. and treat with a liberal application of GF No. 400 Bonding Compound. Apply over this surface two coats of Portland Cement Mortar waterproofed with GF No. 10 Integral Waterproofing Paste. Both coats must be worked well into the edges of the old plaster coating. After this is done, cover immediately with wet straw boards firmly braced to position, and kept so until the plaster coat has set.

57. Crack:

If the leak or opening takes the form of a long crack, and there is considerable water coming through it, the best method to pursue is to cut an inverted key into the wall, treat the sides of this key with GF No. 400 Bonding Compound, and then fill key full of mortar waterproofed with GF No. 10 Integral Waterproofing Paste as specified for other plaster coat work.

After this mortar has been tamped in as firmly as possible, it is to be braced with straw boards covered with planks which are to be kept in position and wet for several days until the mortar has had a chance to set thoroughly.

Waterproofing Swimming Pools by the Integral Method

General: Sections 1 to 9 inclusive are to be carefully followed, and—

58. Connecting Drains:

All inlet pipes, outlet pipes, or floor drains are to have copper flashings, extending at least six inches from the side of and soldered firmly to the pipe or drain, this flashing to extend at right angles from the pipe or drain into the concrete.

This flashing should be painted with two thorough coats of GF No. 200 Damp-proofing Coating, or GF No. 16 Foundation Brush Coating, in order to give a flexible joint between the concrete and flashing.

59. Tile or Brick Lining:

Before the tile or brick lining is put in, the surface of the concrete is to be thoroughly chipped in order to afford a bond for the mortar used in setting.

The mortar used in setting the tile or brick is to be waterproofed in accordance with sections 43, 44 and 47.

60. Plaster Coat, Waterproofed:

A plaster coat at least 1 inch thick is to be applied to the side walls and floor of this pool, in accordance with sections 1 to 4, 10 to 17, and—

The final coat of mortar is to be scratched, as soon as it is set up sufficiently, instead of being trowelled smooth, in order to afford a mechanical bond for the mortar used in setting the enamel brick, tile or brick lining.

(Note: In case no brick or tile lining is to be used, the surface of this finish coat is to be trowelled smooth.)

61. Platform Around Pool:

The plaster coat is to be carried through the gutter up and over the platform surrounding the pool, and up the walls surrounding this platform in a 6-inch base.

Reinforced Concrete Slabs for Walls and Floors

Strength Required to Resist Water Pressure

In waterproofing Reinforced Concrete Walls and Floors that are subjected to a hydrostatic head, it is necessary that the Wall or Floor be strong enough to resist the water pressure, for the waterproofing itself is not counted upon as a structural element.

This design can be made very accurately where the hydrostatic head, or depth of the water, is known, but it is often hard to determine—especially in the case of Foundations and Cellars of Buildings. These are, in nearly all cases, banked with earth which in dry weather contains no water but which may become saturated at the time of rain-storms and floods.

The hydrostatic head to be used in designing Tanks, Reservoirs, and Dams is definitely known and must be taken at its full value in accordance with the well known laws of hydrostatic pressure, but the tendency in designing the floors and walls of cellars is to assume a hydrostatic head entirely too large for the existing conditions, with a consequent needless expenditure of money.

Every foundation and cellar floor should be constructed with a good drainage system and this, with the natural drainage of the surrounding earth, relieves the water pressure to such an extent that the hydrostatic head is decreased and rarely if ever amounts to more than 50 percent of the maximum under such conditions. Where the drainage system is liable to become clogged due to the nature of the soil a greater percentage of the maximum pressure must be considered.

Retaining Walls for earth pressure are often designed to resist a fluid pressure of one-half the intensity of water pressure—one authority recommending that Retaining Walls be considered as subjected to the pressure of a fluid weighing 28 pounds per cubic foot; and as this rule has proven practical and safe for Retaining Walls, it is a safe rule to follow in designing floors and walls for basements that are located in any but swampy ground.

Position of Reinforcing Steel

In reinforced concrete slabs the reinforcing steel is placed to resist tension stresses and the concrete, which is weak in tension, is designed to resist compression stresses.

Where concrete walls are used to resist water pressure and the walls are of simple design, having horizontal reinforcement only, the reinforcing steel is placed near the surface on the opposite side from the water face.

In the floors of a building the loads are placed upon the upper surface of the slabs and the reinforcing steel is placed near the under side of the slab. In the case of basement floors, however, designed to resist water pressure from beneath, the position of the reinforcing steel is reversed, i. e., it is placed near the top of the slab.

To find the pressure exerted by a given head of water, multiply the head in feet by 62.5 pounds. Thus: A 10-foot head of water will exert a pressure of 625 pounds per square foot.

EXPLANATION OF TABLE 1 Reinforced Concrete Slabs for Walls Horizontal Water Pressure

The Table of Reinforced Concrete Slabs for Walls (Table 1) is a table of Total Loads per square foot that can be safely resisted by slabs of various spans and thicknesses with different amounts of steel reinforcement. It is used in the design of walls, constructed as reinforced concrete slabs, with vertical supports (or buttresses) at stated intervals, and in which the reinforcement runs horizontally between supports.

To illustrate the use of this Table we will consider as a slab a section of wall having vertical supports 12 feet apart and on the other side of the wall—water 10 feet deep.

It is evident that the pressure against this wall varies from a maximum at the bottom, or deepest point, to nothing at the top. Consequently the wall must be strong enough to resist the maximum pressure at the bottom and the strength may be gradually decreased toward the top. If the wall is considered as made up of successive horizontal layers or laminations one foot deep and each layer designed to resist the pressure of the water at that depth, the result will be a design that is safe and economical.

Consider first the bottom layer, 1 foot deep. The mean depth of water on the face of this layer is $9\frac{1}{2}$ feet. The pressure of the water is $9\frac{1}{2} \times 62\frac{1}{2} = 593\frac{3}{4}$ pounds and the bottom section must therefore be designed to resist that pressure.

In Table 1 find the span 12 feet (the distance between supports) in the column headed "Clear Span in Feet." Opposite this on the same horizontal line, we find under the vertical column "Total Thickness of Slab" that an 11 inch slab has a strength of 590 pounds per square foot and while the actual pressure exerted is about 4 pounds greater than this, we can use this slab with safety.

In the same vertical column opposite "Area of Steel per Foot of Width" we find that .81 square inches of reinforcing steel is required per foot width of slab. And opposite "Effective Depth of Slab" we find that this steel must be placed 9 inches from the water face of the wall.

The proper design is a wall built up after the manner described for the bottom layer considering the exact water pressure to which each layer or step is subjected, and in foundations for buildings, the weight of the superstructure it must support. For all practical purposes in connection with small work, however, the usual method is to design the wall of a uniform thickness sufficient to take the maximum pressure.

EXPLANATION OF TABLE 2 Reinforced Concrete Slabs for Floors

Upward Water Pressure

In reinforcing floors against a water pressure, the reinforcing steel *must be placed near the top of the slab.*

The Table of Reinforced Concrete Slabs for Floors (Table 2) shows the total thickness of slab, the amount of reinforcing steel required and the distance from the water face of the slab to the center of the reinforcing. It considers reinforcing steel placed in one direction only.

To illustrate we will take the case of a floor slab with supports 15 feet apart, subjected to a pressure caused by a 7-foot head of water. The pressure, or in this case the lifting power, of the water is $7 \times 62\frac{1}{2} = 437\frac{1}{2}$ pounds per square foot.

Find the span 15 feet in the column "Clear Span in Feet" in Table 2. Opposite this and on the same horizontal line we find under the column "Total Thickness of Slab" that an 11-inch slab will resist a water pressure of 515 pounds per square foot, while the actual lifting power of a 7-foot column of water is only $437\frac{1}{2}$ pounds per square foot.

In the same vertical column opposite "Area of Steel per Foot of Width" we find that .81 square inches of reinforcing steel is required per foot width of slab. And opposite "Effective Depth of Slab" we find that this steel must be placed 9 inches from the bottom face of the slab.

As the water pressure is the same over the entire floor the thickness of the slab and the amount of reinforcing steel will be the same at every point.

The safe pressure loads, given in Table 2, include the weight of the slab.

Reinforced Concrete Slabs for Walls

Safe Loads in Pounds per square foot

Total Thickness of Slab	4''	5''	6''	7''	8''	9''	10''	11''	12''	13''	14''	15''	16''			
	3''	4''	5''	6''	6½''	7½''	8''	9''	10''	11''	12''	13''	14''			
Effective Depth of Slab																
Stress in Concrete 640# per sq. in. Stress in Steel 16000# per sq. in. % of Steel = .75 B. M. = $\frac{W_L}{10} n = 15$ CLEAR SPAN IN FEET	3	1050	1865	2910	4210	4940	6580	7480						3		
	4	592	1050	1620	2360	2780	3690	4200						4		
	5	377	670	1050	1510	1775	2350	2680	3400	4200				5		
	6	262	467	730	1050	1230	1640	1865	2360	2920				6		
	7	193	344	535	770	905	1205	1370	1740	2140	2590	3080		7		
	8	148	262	410	590	695	923	1050	1330	1640	1990	2360	2770	3220	8	
	9	116	207	324	467	547	730	830	1050	1295	1570	1870	2200	2540	9	
	10		168	262	377	445	590	670	850	1050	1270	1510	1780	2060	10	
	11			139	216	312	365	486	555	702	870	1050	1245	1465	1700	11
	12				182	262	306	408	465	590	728	885	1050	1215	1420	12
	13				154	222	261	348	395	500	620	750	890	1050	1220	13
	14				134	193	226	300	342	433	535	650	770	905	1050	14
	15					167	196	262	298	377	465	565	670	790	915	15
	16					147	173	230	262	332	408	495	590	692	802	16
	17					130	153	203	232	294	363	440	520	615	710	17
	18						136	181	206	261	323	391	465	545	635	18
	19							162	185	235	290	350	417	490	568	19
	20								168	212	262	318	378	445	515	20
	Weight of slab per sq. foot	50	63	75	88	100	113	125	138	150	163	175	187	200		
		Area of Steel per ft. width														
	.27	.36	.45	.54	.585	.675	.72	.81	.90	.99	1.079	1.17	1.26			

Reinforced Concrete Slabs for Floors

Safe Loads in Pounds per square foot

Total thickness of Slab	4"	5"	6"	7"	8"	9"	10"	11"	12"	13"	14"	15"	16"			
	3"	4"	5"	6"	6½"	7½"	8"	9"	10"	11"	12"	13"	14"			
Stress in Concrete 640# per sq. in. Stress in Steel 16000# per sq. in. % of Steel = 75 B. M. = $\frac{W_L}{10} n = 15$	3	1100	1928	2985	4298	5040	6693	7605						3		
	4	642	1113	1695	2448	2880	3803	4325						4		
	5	427	733	1125	1598	1875	2463	2805	3538	4350				5		
	6	312	530	805	1138	1330	1753	1990	2498	3070				6		
	7	243	407	610	858	1005	1318	1495	1878	2290	2753	3255		7		
	8	198	325	485	678	795	1036	1175	1468	1790	2153	2535	2957	3420	8	
	9	166	270	399	555	647	843	955	1188	1445	1733	2045	2387	2740	9	
	10		231	337	465	545	703	795	988	1200	1433	1685	1967	2260	10	
	11			202	291	400	465	599	680	840	1020	1213	1420	1652	1900	11
	12				257	350	406	521	590	728	878	1048	1225	1402	1620	12
	13				229	310	361	461	520	638	770	913	1065	1237	1420	13
	14				209	281	326	413	467	571	685	813	945	1092	1250	14
	15					255	296	375	423	515	615	728	845	977	1115	15
	16					235	273	343	387	470	558	658	765	879	1002	16
	17					218	253	316	357	432	513	603	695	802	910	17
	18						236	294	331	399	473	554	640	732	835	18
	19							275	310	373	440	513	592	677	768	19
	20								293	350	412	481	553	632	715	20
	CLEAR SPAN IN FEET															
	Weight of slab per sq. ft.															
Area of Steel per ft. width																
	.27	.36	.45	.54	.585	.675	.72	.81	.90	.99	1.079	1.17	1.26			

GF No. 11 Integral Waterproofing Powder

Some architects in specifying integral waterproofing require a powder to be mixed with the cement in place of a paste dissolved in the gauging water. For such work the powder must be a waterproof material in itself and can only be depended upon when carefully and thoroughly mixed with the cement.

GF No. 11 Integral Waterproofing Powder is the same material which forms when GF No. 10 Paste combines with cement, in the finished concrete or mortar. It is therefore classed as a preformed waterproofing element and depends upon thorough distribution throughout the dry cement for its success. GF No. 11 has a much higher specific gravity than cement and readily fills up all the voids during the mixing process.

In the finished mass, whether concrete or mortar, GF No. 11 Waterproofing Powder maintains its water-repelling qualities permanently. It does not in any way affect the set of material with which it is used for a corrective agent in the Powder overcomes any tendency to retard the set or weaken the mass.

General Directions and Quantities Required

GF No. 11 Integral Waterproofing Powder is to be added to Portland Cement in the proportion of two pounds to each bag of cement or eight pounds to each barrel used in any mixture. These two are to be thoroughly mixed dry so as to insure complete distribution of the GF Powder.

Add this mixture to the sand, which should never be less than two parts nor more than two and a half parts by volume, the whole to be manipulated until the mass is evenly mixed and is uniform in color. In case of mass concrete this mixture is to be added to the aggregate and thoroughly turned over at least three times.

Mass Concrete				GF No. 10
Material Required per Cubic Yard				PASTE
MIXTURE	CEMENT	SAND	STONE	GF No. 11
1:2 :4.....	1.50 bbls.	.42 cu. yds.	.84 cu. yds.	POWDER
1:2½:5.....	1.24 bbls.	.44 cu. yds.	.87 cu. yds.	per cu. yd.
				12.00 lbs.
				9.92 lbs.

Waterproofed Plaster				GF No. 10
Material Required per 100 Square Feet				PASTE
MIXTURE	THICKNESS	CEMENT	SAND	GF No. 11
1 Cement.....	1¼ in.	1.28 bbls.	.36 cu. yds.	10.25 lbs.
2 Sand.....	1 in.	1.03 bbls.	.29 cu. yds.	8.20 lbs.
	¾ in.	.90 bbls.	.25 cu. yds.	7.17 lbs.
	¾ in.	.77 bbls.	.22 cu. yds.	6.15 lbs.
	¾ in.	.64 bbls.	.12 cu. yds.	5.12 lbs.
1 Cement.....	1¼ in.	1.10 bbls.	.39 cu. yds.	8.77 lbs.
2½ Sand.....	1 in.	.88 bbls.	.31 cu. yds.	7.01 lbs.
	¾ in.	.77 bbls.	.27 cu. yds.	6.14 lbs.
	¾ in.	.66 bbls.	.23 cu. yds.	5.26 lbs.
	¾ in.	.55 bbls.	.19 cu. yds.	4.38 lbs.

GF No. 17 Mop Coating and GF No. 18 Waterproof Felt

In a great many cases where substructural work must be waterproofed against a considerable head of water with no permanent drainage system to carry it off, a heavy waterproof mat is necessary. This mat has no structural strength in itself and must, therefore, be supported by a concrete slab or brick retaining wall of sufficient strength to withstand the hydrostatic head.

For example: If the waterproof mat or membrane is to overcome an eight foot head of water the backing wall is built to resist a pressure of 500 pounds per square foot.

A membrane used under such condition must be tough, pliable and totally impervious to water or any acids which might be held in solution. Unless it is also elastic so as to expand or contract with the wall, serious breaks may occur from temperature changes.

GF No. 17 Mop Coating is a heavy bitumen used as a base for building up membrane waterproof courses. It has been freed from such elements as residium oils, resin, etc., which have no permanent waterproofing value because they become brittle and crack off in contact with water or moisture. GF No. 17 remains elastic at zero and will not run or slide at 110 degrees Fahrenheit. It repels water, ammonia solutions, hydrochloric and sulphuric acids and saturated solutions of sodium chloride.

It must be melted before using and applied hot and is most effective over GF No. 16 Foundation Brush Coating which saves the material and aids in bonding. This is particularly true when waterproofing in cold weather.

GF No. 18 Waterproof Felt is manufactured for use with GF No. 17 Mop Coating in the type of waterproofing just described. It is a strong water-repelling felt made up of wool stock with linen and wood fiber to give it great tensile strength.

Saturation of GF No. 18 takes place during the process of manufacture so that every fiber is thoroughly covered with the bitumen used. This method of saturation as compared with the simple dipping process leaves the felt pliable and elastic even under high temperature and protects it completely against water, acids and alkalies. Its toughness is also increased by the GF method of saturation in which the waterproofing element penetrates as well as coats the felt.

The covering capacity of GF No. 17 Mop Coating applied with GF No. 18 Waterproof Felt varies only with the thickness of the coat.

1/16" Coating	26 sq. ft. per gallon
1/24" Coating	38 sq. ft. per gallon

Specifications for Waterproofing with GF No. 17 Mop Coating and GF No. 18 Waterproof Felt

1. General Conditions:

The Waterproofing course to consist of three ply or layers (or as many ply as may be necessary for the particular work in hand) of GF No. 18 Waterproof Felt and four ply or coatings of GF No. 17 Mop Coating, applied hot. This Waterproofing course to be carried across all footings, both interior and exterior, under all floors and partitions, including the side walls and floors of any and all pits, and up all walls in contact with the ground to grade level.

2. Materials:

GF No. 17 Mop Coating and GF No. 18 Waterproof Felt, as manufactured by The General Fireproofing Company, Youngstown, Ohio, are to be purchased direct from the manufacturers or their authorized Agents, and delivered on the building site in original and sealed packages.

3. Preparing Angles:

To prevent the danger of breaking the Waterproofing course, Waterproofing shall not be applied to right angle surfaces, such as the junction between floors and walls, before such angles are sloped or coved with cement to form a firm and even bed for the application of the Waterproofing. Before applying the Waterproofing over a right angle corner of brick or concrete masonry, the corner shall be chipped off and smoothed up with cement mortar to give a round turn.

4. Applying Waterproofing to Footings and Through Key:

After a masonry surface has been thoroughly dried and cleaned of projections and foreign matter, the surface of the footing is to be swabbed with hot GF No. 17. In this is to be embedded Felt of sufficient width to extend 6 inches on either side of the wall line. Continue this alternate swabbing and embedding of Felt until the full five ply of Felt and six swabbings of Mop Coating have been laid through this footing and key.

5. Wall Waterproofing:

First: The 6-inch lap already left laying on the outside of the wall line is to be turned up and sealed to this wall with a swabbing of GF No. 17. Then the Waterproofing is to be applied as hereinafter specified.

If Either GF No. 15 Trowel Coating or GF No. 16 Foundation Brush Coating are to be Used Before the First Mop Coating is to be Applied:

First: After the masonry surface has been thoroughly dried and cleaned of projections and foreign matter, an under coating of GF No. 15 or 16 is to be applied over the entire surface to be waterproofed. After this coat has set, the surface is to be thoroughly swabbed with a good even coat of GF No. 17 applied at such a degree of heat that it does not lump but spreads evenly. Then a layer of GF No. 18 Felt is to be immediately embedded in this hot coating and carefully pressed down so that there are no wrinkles or ridges.

Then proceed as hereinafter specified with the second swabbing.

Where the GF No. 17 Mop Coating is to be Applied Directly to the Surface of the Masonry:

First: After the masonry surface has been thoroughly dried and cleaned of projections and foreign matter, the surface is to be thoroughly swabbed with a good even coat of GF No. 17 applied at such a degree of heat that it does not lump when it comes in contact with the cold masonry but spreads on smoothly; then a layer of GF No. 18 Felt is to be immediately embedded in this hot coating and carefully pressed down so that there are no wrinkles or ridges.

Second: Swab this layer of Felt with a thorough coating of GF No. 17, then lay another thickness of GF No. 18 Felt over the full width of the sheet already placed, and mop this thoroughly with another coating of GF No. 17.

Third: Lay another layer of GF No. 18 Felt the full width of those already laid and mop with GF No. 17.

Fourth: The next layer of Felt is to be lapped over two-thirds of its width over the preceding layers and is to be mopped in the same manner.

Specifications—Continued

Fifth: The next layer of Felt is to be lapped over two-thirds of its width over the preceding layer and is to be mopped in the same manner.

This method of procedure is to be continued until the whole surface is covered. After the entire surface to be waterproofed has been covered, all flashings and joints made, the entire top surface of the Felt is to receive a thick mop coating of the GF No. 17 applied hot.

6. Application of Four Ply or More:

With the exception of the direction of the layers, the preceding instructions for application are to be followed. Where four plies are to be used, the best method is to lay two plies and two plies at right angles; where five plies are to be used, three plies and two plies at right angles; where six plies are to be used, three plies and three plies at right angles.

7. Laying Waterproofing Over Floors:

After the concrete underbed has been cleaned and all depressions pointed up with mortar and the same is perfectly dry, the first ply of Waterproofing shall be laid as heretofore specified, great care being taken that a firm joint is made between this layer and the lap of 6 inches left extending on the inside of the wall.

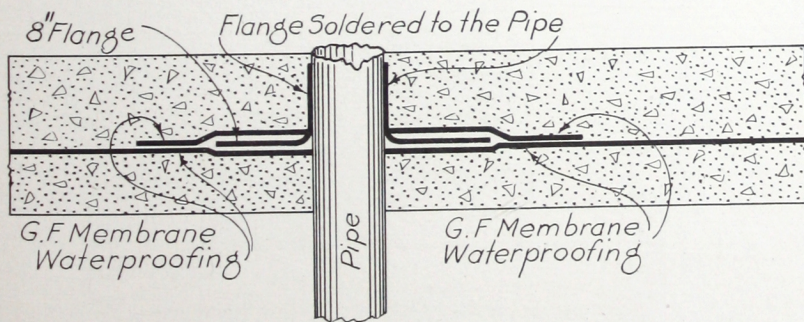
8. Protection of Waterproofing:

After the Waterproofing course over the floor or over the side walls has been finished it shall be protected with a 1-inch thick plaster coat of 1:2 cement mortar applied directly over the last swabbing of GF No. 17.

A single course of brick may be used to protect the side wall Waterproofing. In case brick is used great care should be taken in laying this brick to be sure that the Waterproofing course is not punctured. If possible, the brick work should be offset one inch from the Waterproofing course so that this opening may be poured full of cement grout after the wall is finished.

9. Connecting Waterproofing to Pipes, Conduits, Etc.:

All pipes, conduits, etc., passing through the Waterproofing are to have copper flanges extending 8 inches out on floors and 5 inches up on pipes or conduits. After Waterproofing is installed these flanges are to be placed, sticking under surfaces of



the flanges to the Waterproofing with hot GF No. 17 and then soldering the tops to conduits or pipes. Apply over these flanges three plies of Waterproofing solidly stuck to the flanges, coated and extended 8 inches out on floor Waterproofing.

10. Flanges for Hot Water and Steam Pipes:

In the case of hot water or steam pipes the flanges must be of iron and the pipes threaded so that the flanges can be screwed onto the pipes using red lead to render the screw joints watertight. After the flanges have been screwed in place, their lower edges should be waterproofed with three plies of Waterproofing solidly stuck to the flange of the flange and the Waterproofing carried out over the floor at least 8 inches.

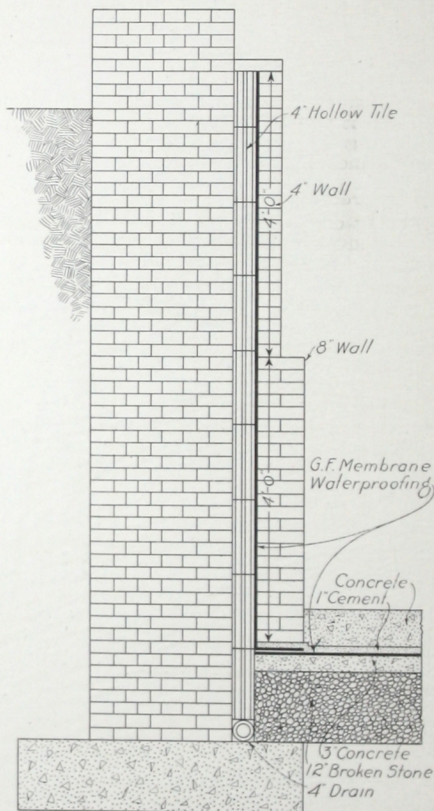
Specifications—Continued

Waterproofing Against Heavy Pressure in Conjunction with a Drainage System

General: Sections 1 to 10 inclusive are to be carefully followed, and

11. Drainage System:

Sufficient drainage gutters or hollow tile drains must be installed to lead out all water. The drainage gutters or hollow tile drains must all lead to a sump pit in which is installed an automatic or steam pump for the purpose of ejecting the water drained to this pit.



12. Flashing at Top of Wall:

After the wall Waterproofing has been finished up to the desired height, a lap of 4 inches is to be left so that the Waterproofing may be turned back into the wall 4 inches at grade level to prevent water seeping in over the top of the Waterproofing.

13. Permanent Sump Hole:

The rim for this permanent sump hole should either be furnished with a cast flange or some type of metal flange firmly attached to it by a waterproof joint, so that the membrane Waterproofing may be flashed either side of this projection on the rim to afford a perfectly watertight joint around the sides of the sump hole.

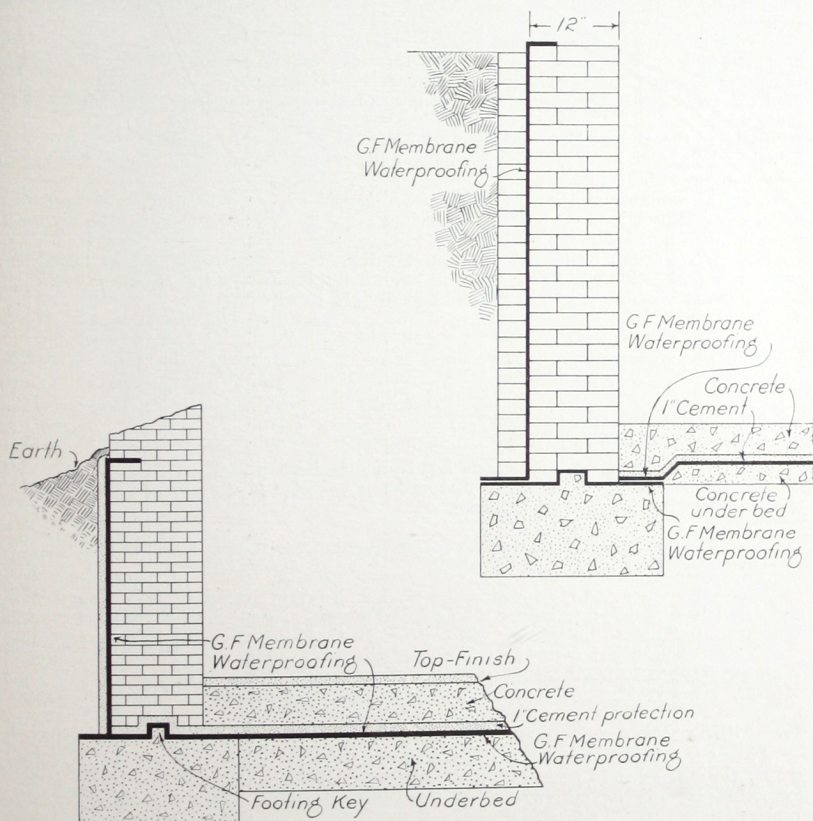
Specifications—Continued

Waterproofing Against Heavy Pressure without the Installation of a Drainage System

General: Sections 1 to 13 are to be carefully followed, and

14. Protecting Wall:

Before the protecting wall is laid a 1-inch coat of cement plaster must be applied over the entire course of Waterproofing. In laying the protecting wall, great care is to be taken not to injure the Waterproofing and all joints of the brickwork are to be well filled with mortar, having the latter rather wet and using a shove joint. If it is possible to do so, an opening should be left between the protecting coat of cement mortar and the brickwork into which a thin grout of Portland Cement and sand should be poured.



Specifications—Continued

Leaky Basement, Boiler Pit or Elevator Pit to be Waterproofed

General: Sections 1 to 13 are to be carefully followed, and
Method 1

15. Wall Construction:

First: Build an outer wall 12 inches thick and 3 feet in height; then set back from the inner face 4 inches and build 3 feet more of wall; then set back again from the inner face 4 inches and build 3 feet more in height. All the angles formed by the setting back are to be rounded off and coved up with cement mortar as heretofore specified, so as not to break the Waterproofing course in making the turns.

Second: Then apply a sufficient number of ply of Waterproofing to the inner face of the wall in accordance with section 5, extending it across the full width of the footing on the inside and carrying it out across the full width of the wall at the top.

Third: Protect the Waterproofing with a 1-inch plaster coat as heretofore specified and build against this a wall of the same height as that already built, with the necessary additional brickwork to bring it to the required thickness.

Fourth: Bring the lap of the Waterproofing across the top of the wall to the inner edge.

Fifth: On top of the wall already built, build an outer wall 12 inches thick, 3 feet in height as before; then step back 4 inches and build 3 feet; step back again 4 inches and build 3 feet.

Sixth: Connect the lap of Waterproofing left at the base of this second wall and extend it up the inner face of the second piece of wall after the angles have been coved and rounded and lap on top as before.

Seventh: Then build the additional thickness of wall necessary to resist the pressure against the Waterproofing and extend the lap across the entire wall.

Continue in this manner until the full desired height is reached.

(**Note:** Under the conditions mentioned, a careful computation must be made of the greatest hydrostatic pressure which will be encountered and the wall on the inside of the Waterproofing course must be of sufficient strength to resist the entire pressure of this hydrostatic head.)

Method 2

16. Reinforced Bituminous Mat:

After sections 1 to 13 have been complied with, the Waterproofing is to be carried up the inner face of walls to grade level and then protected by retaining walls of masonry 8 inches in thickness for one-half the height and 4 inches in thickness for the balance of the height of the wall.

Waterproofing Around Columns and Under Grillages

17. Waterproofing Course:

After the surface to be waterproofed has been prepared in accordance with sections 1 to 4 and 7, and before the grillages are set, the specified number of plies of Waterproofing are to be laid on the bed where these grillages are to set, extending the Waterproofing out over the full size of the column footing. The whole layer of Waterproofing is to be thoroughly protected with a 1-inch coat of Portland Cement Mortar.

18. Filling Column Shoes:

After the columns are set the shoes are to be filled solid with Portland Cement grout, the rivet heads plastered over even and smooth and the underbed of floor concrete properly smoothed and graded with Portland Cement. Then lay the Waterproofing over the floor connecting it to the lap under the grillages and extending the Waterproofing up the columns to the desired height above the floor (which should be at least 12 inches above the highest water level).

19. Protecting Brickwork:

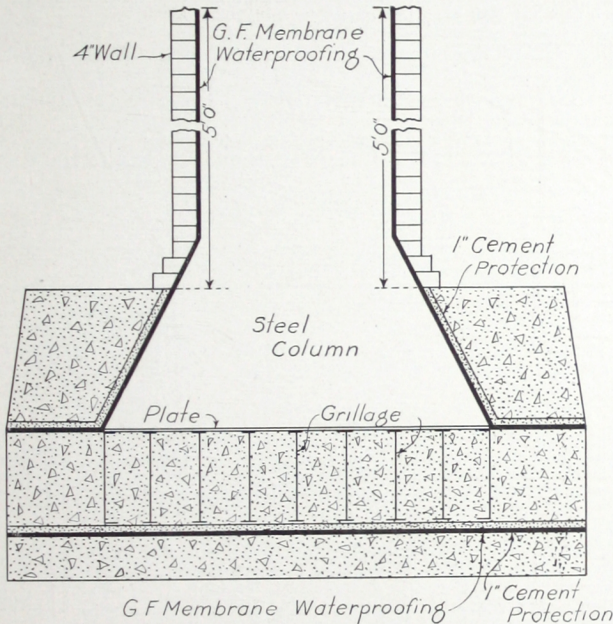
Then build protecting brickwork against the Waterproofing around the column at least 8 inches in thickness for the first four feet in height and 4 inches in thickness for the balance. After this work is completed the finish course of concrete may be laid over the entire floor.

Specifications—Continued

Waterproofing Around Columns

20. Preparation and Application of Waterproofing:

After the underbed of floor concrete is properly graded and smoothed off with Portland Cement Mortar and the rivet heads are all plastered, the Waterproofing is to be laid over the entire floor extending same up columns to a height of 2 to 5 feet (if necessary to extend higher, system previously mentioned should be used), protecting the same with 1 inch of Portland Cement Mortar. Then build 4 inches of brickwork against Waterproofing of columns and lay finish course of concrete over the entire floor.



Built-up Roofs Over Concrete, Wood or Flat Tile

21. Concrete Roof:

The surface of a concrete roof over which Waterproofing is to be applied should be smoothly graded with Portland Cement Mortar, leaving no depressions or rough spots. Over the entire surface lay four plies of GF No. 17 Mop Coating and GF No. 18 Waterproof Felt. This is to be laid in accordance with sections 1, 2, 3, 6 and 7.

22. Wood Roofs:

Where Waterproofing is to be laid over the surface of wood roofs, the surface of the wood should not be coated but covered with a layer of building paper lapped at least 2 inches and every lap nailed with roofing tins and nails 5 feet apart.

Then apply the Waterproofing in accordance with sections 1, 2, 3, 6 and 7.

23. Tile:

In case tile is to be laid over the Waterproofing, a bed of cement mortar not less than 1 inch in thickness waterproofed with GF No. 10 Integral Waterproofing Paste should be laid over the final coating of GF No. 17. Into this the tile should be embedded, bringing them up to a true and even surface. The joints between the tile

Specifications—Continued

are to be one-quarter inch in width and filled with Portland Cement Grout waterproofed with GF No. 10 Integral Waterproofing Paste.

24. Slag or Gravel:

In either case where the finish of the roof is to be of slag or gravel, it is to be applied at the same time as the final coating of GF No. 17. The GF No. 17 to be applied thickly, pushing into it as much as possible of the slag or gravel, in any case not less than 400 pounds of slag or 500 pounds of gravel per square. The gravel or slag, whichever is used, must be perfectly dry. If necessary, heat it to obtain this result.

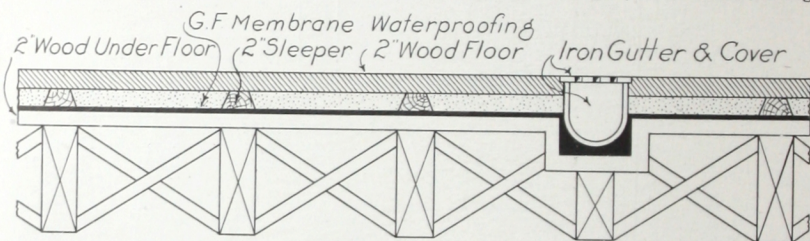
25. Expansion Joints:

If expansion joints are required, they should be not less than 1 inch in width and be filled with GF No. 250 Mastic Cement.

Floor Construction of Mills, Garages, Stables, Etc.

26. Wood Floors:

If gutters are required wooden boxes are to be constructed at least 2 inches wider and 2 inches deeper than the depth and width of the iron gutters, so that there may be a space for applying the Waterproofing (see sketch). Over the wood under floor lay one ply of GF No. 18 Waterproof Felt, lapping the edges 2 inches and nailing



well with flats and nails. Then apply the number of layers of Waterproofing to be used in accordance with sections 1, 2, 3, 6 and 7, extending this course down and around sides and bottoms of gutter boxes. After the iron gutters are installed, fill in under them with hot GF No. 17 so that the entire space shall be filled solid.

27. Laying Sleepers for Finished Floor:

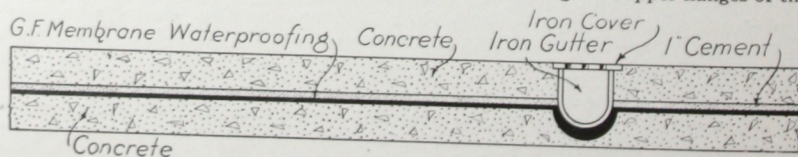
The sleepers for the finished flooring are to be laid and nailed at the same time the surface coating of GF No. 17 is being applied, the carpenters working with the waterproofers to the end that the sleepers may be embedded in the hot GF No. 17 Mop Coating, and a thorough junction made between the coating and the nail so there will be no leak where the nail punctures the Waterproofing course.

28. Concrete Floors:

Form depressions in the concrete underbed for iron gutters which are to have copper flanges on either side at least 6 inches in width. These gutters are to be set so that they will come to the proper level in relation to the finish floor. After the underbed of concrete is properly smoothed and graded with Portland Cement Mortar lay the Waterproofing over the entire floor in accordance with sections 1, 2, 3, 6 and 7, including the depressions for the gutters.

29. Setting Gutters:

Set the gutters so that the flanges will rest upon the Waterproofing and fill under the gutters solid with GF No. 17 Mop Coating. Then bring the copper flanges of the



Specifications—Continued

gutter down upon the Waterproofing, nailing these flanges at least every 6 inches. Then lay three plies of Waterproofing the full width of the flanges, lapping 8 inches out on floor Waterproofing.

30. Protecting Waterproofing:

Protect the entire surface of the Waterproofing with 1 inch of Portland Cement Mortar and after this has thoroughly set lay the finished concrete floor.

Seepage and Natural Soil Drainage, Dampproofing Against

31. Materials:

GF No. 17 Mop Coating, as manufactured by the General Fireproofing Company, Youngstown, Ohio, is to be purchased direct from the manufacturers or their authorized Agents and is to be delivered on the building site in original sealed packages. It is to be applied without addition or adulteration.

32. Preparing Surfaces:

All surfaces to be coated are to be clean, dry and free from all loose particles or mortar, etc.

Wherever water is present it must be carried away by drainage or pumping so as to maintain the work in an absolutely dry condition.

33. Application:

GF No. 17 must be applied (with an ordinary cotton yarn mop) at such a degree of heat that it will not lump when it comes in contact with cold masonry. The material must be kept at a temperature ranging from 250 to 300 degrees in the "kettle" in order to be of proper consistency.

After the surfaces have been cleaned and are absolutely dry, apply two thorough covering coats of GF No. 17 over the footing course and through the key, in the following manner:

First: Coat the entire footing and imbed in this coating (while hot) a layer of GF No. 18 Waterproof Felt, allowing same to lap at least 6 inches either side of the wall lines.

Second: Coat this Felt with a thorough coating of GF No. 17, taking care that the Felt is not displaced in the operation.

Third: After the foundation wall is set in place, the lap on the outside of the footing is to be turned up and stuck to this wall with a coating of GF No. 17, after which two thorough covering coats are to be mopped over the outside of the wall up to grade.

34. Connection to Lap:

Great care must be taken that a perfect connection is made to the lap through the footing.

35. Floor:

After the rough concrete floor has been prepared, mop two thorough covering coats of GF No. 17 over this surface, connecting with the laps through the footings.

After this has been done, the finish floor is to be laid over this coating. (The finish floor in no case to be less than 3 inches in thickness.)

Specifications for Waterproofing Road Bridges

1. General:

The Waterproofing course is to consist of 3-ply or layers (or as many ply or layers as the Engineer may direct) of GF No. 18 Waterproof Felt, and 4-ply, or coatings, of GF No. 17 Mop Coating applied hot. This Waterproofing course to be carried across the entire deck of the bridge, flashed up the curbing and into reglets prepared for this purpose.

The expansion joints are to be waterproofed either side of the joint itself at least 6 feet, with 2-ply, or courses, of GF No. 21 Saturated Fabric and 3-ply, or layers, of GF No. 20 Waterproofing Mastic.

Specifications—Continued

2. Materials:

GF No. 17 Mop Coating, GF No. 18 Waterproof Felt, GF No. 20 Waterproofing Mastic, and GF No. 21 Saturated Fabric, are to be those manufactured by The General Fireproofing Company, Youngstown, Ohio, and are to be purchased direct from the manufacturers or their authorized Agents. These materials are to be delivered to the building site in original and sealed packages.

3. Preparing Angles:

To prevent the danger of breaking the Waterproof Felt, Waterproofing shall not be applied to right angles, such as the junction between floors and curb, before such angles are sloped or coved with cement to form a firm and easy bed for the application of the Waterproofing. Before applying the Waterproofing over a right angled corner of masonry, the corner shall be chipped off and smoothed up with cement mortar to give a round turn.

4. Preparation for Waterproofing:

All vertical or sloping surfaces of concrete shall be thoroughly cleaned of dust, dirt, loose particles and other foreign matter. The use of a hand bellows is recommended for cleaning off loose sand and dirt from the surface.

5. Flashing Reglet:

When the curbs are formed at the sides of the bridge, reglets shall be formed in these curbs at least $\frac{3}{4}$ inch deep, and of a height to bring their top edge at least 1 inch below the finished surface of the paving.

6. Painting Concrete:

In cold weather, the surface of the concrete shall be painted with two coats of GF No. 200. The material for the first coat shall be diluted with gasoline so as to give a brownish tint. The second coat shall be applied as it comes from the container. Both coats of paint shall be thoroughly worked into the surface so as to give a uniform coating.

Paint shall not be applied to damp concrete or steel. The paint is to be applied immediately in advance of the Waterproofing, and before dust or dirt has had a chance to collect after the cleaning.

7. Application of Waterproofing:

After the surface has been prepared in accordance with the foregoing specifications, the Waterproofing shall be applied, laying the Waterproofing Felt "shingle fashion" transversely to the center line of the bridge in the following manner:

First: The surface of the concrete shall be thoroughly swabbed to the width of one sheet of felt with GF No. 17 Mop Coating applied at such a degree of heat that it does not lump when it comes in contact with the cold masonry, but spreads on evenly.

Second: Then imbed in this swabbing of GF No. 17 a layer of GF No. 18 Waterproof Felt, which is to be carefully pressed down so that there are no wrinkles or ridges.

Third: Swab the surface of this felt thoroughly, and immediately imbed another layer of felt in the same manner.

Fourth: Swab the layer of felt laid down, its full width with GF No. 17 and immediately imbed another layer of felt in the same manner.

Fifth: The next layer of felt is to lap two-thirds of its width over the preceding layer already put down, and is to be swabbed in the same manner. All succeeding layers of felt are to lap two-thirds of their width over those layers already put down except as hereinafter specified.

Sixth: This Waterproofing course is to be carried to within 6 feet of the expansion joints, at which point the final layer of felt is to be omitted, and the work started again in the same manner, except that the third layer of felt is to be omitted for the time being, 6 feet on the opposite side of the expansion joints.

Seventh: A 2-ply course of GF No. 20 Waterproofing Mastic and 21 Saturated Fabric is to be laid shingle fashion in the same manner over this expansion joint, running horizontally to the center line of the bridge. This course is to lap over the entire width of the last layer of GF No. 18 Waterproof Felt put down.

Specifications—Continued

Eighth: After this 2-ply course of GF Nos. 20 and 21 has been applied and thoroughly sealed, a layer of felt is to be laid across the end of the laps of GF Nos. 20 and 21 so as to thoroughly seal them to the course of GF Nos. 17 and 18 laid transversely to the center line of the bridge. This layer of felt must be thoroughly sealed, two-thirds of its width, lapping over the Nos. GF 20 and 21 and one-third of its width over the course of GF Nos. 17 and 18.

Ninth: Two sealing layers of felt are to be laid along the gutter line next the curb flashing up into the reglet already prepared for the full length of the bridge.

Tenth: Then the entire surface of this Waterproofing is to be thoroughly swabbed with a heavy coating of GF No. 17 Mop Coating.

8. Protecting Waterproofing:

The entire surface of the Waterproofing is to be plastered with 1 inch of cement mortar applied rather wet.

9. Sand Cushion:

The sand cushion is to be the thickness specified by the Chief Engineer, and is not to be put down until the plaster coat underlying it has thoroughly set and hardened so there is no danger of breaks or abrasion.

10. Flashings Over Bridge Ends:

A 3-ply course of GF Nos. 17 and 18 is to be carried down over the ends of the bridge at least 3 feet. This flashing must extend back onto the flat surface of the Waterproofing at least 6 feet.

11. Connecting Waterproofing to Pipes, Conduits, Etc.:

All pipes, conduits, etc., passing through the Waterproofing are to have copper flanges extending 8 inches out on floors, and 5 inches up on pipes or conduits. After the Waterproofing is installed, these flanges are to be placed, sticking the under surface of the flange to the Waterproofing with hot GF No. 17 and soldering the top to the conduit or pipe.

Then apply over these flanges 3-ply of Waterproofing solidly stuck to the flanges, coated, and extended 8 inches out on floor Waterproofing.



Fifth Avenue Bridge, Youngstown, O. Deck waterproofed with GF Nos. 20 and 21

GF No. 20 Waterproof Mastic and GF No. 21 Saturated Fabric

On some jobs where it is advisable to use Membrane Waterproofing the advent of even a slight leak would cause a great deal of damage. And very often the natural vibration of the structure or its expansion and contraction are so great that a waterproof felt will not withstand the strain.

Under such conditions a fabric must be used that is exceptionally elastic, expanding in any direction without danger of breaking, and with enough tensile strength to hold off a considerable head of water in case there is a split in the backing wall or floor. Bridge decks, above grade swimming pools and similar structures require this class of Waterproofing. And as there are often a great many sharp angles to turn the fabric must be flexible enough to fit snugly without cracking.

GF No. 20 Waterproofing Mastic is a pure bitumen coating used for embedding waterproof fabric. All the elements which are in any way dried up or disintegrated by water have been extracted leaving a thick black coating that remains intact at zero and does not run at 110 degrees Fahrenheit. It forms a continuous film, expanding or contracting readily with the wall on which it is applied.

GF No. 21 Saturated Fabric consists of a heavy fine quality cotton fabric so saturated with pure bitumen that every thread and fiber is thoroughly soaked with the Waterproofing. This method not only effectively waterproofs the fabric but also preserves all of its natural tensile strength, elasticity and flexibility.

It can be depended upon to keep out water in case of a fracture in the steel, brick or concrete backing which might be caused by expansion, vibration or settling. In laying Waterproofing courses with GF No. 21 it is not necessary to cove up right angles with cement mortar for the fabric is entirely flexible and takes right angles without breaking.

Two plies of GF No. 21 will be found sufficient for any waterproofing job.

Covering capacity (GF No. 20 applied with GF No. 21):

1/16" coating.....	26 sq. ft. per gallon
1/24" coating.....	38 sq. ft. per gallon

Specifications for Waterproofing with GF No. 20 Waterproofing Mastic and GF No. 21 Saturated Fabric

1. General Conditions:

The Waterproofing course to consist of 2-ply of GF No. 21 Saturated Fabric and 3-ply or coatings of GF No. 20 Waterproofing Mastic applied hot. This Waterproofing course to be carried across all footings, both interior and exterior, under all floors and partitions, including the side walls and floors of any and all pits and under and up all walls in contact with the ground to grade level.

2. Material:

GF No. 20 Waterproofing Mastic and GF No. 21 Saturated Fabric as manufactured by The General Fireproofing Company, Youngstown, Ohio, are to be purchased direct from the manufacturers or their authorized Agents, and are to be delivered on the building site in original and sealed packages.

Specifications—Continued

3. Applying Waterproofing to Footing and Through Key:

After the masonry surface has been thoroughly dried and cleaned of projections and foreign matter, the surface of the footing is to be swabbed with hot GF No. 20. In this hot coating is to be imbedded fabric of sufficient width to extend 6 inches on either side of the wall line. Then the surface of this fabric already imbedded is to be thoroughly swabbed with hot GF No. 20 and another layer of fabric imbedded the full width of the layer already put down. The surface of this second layer of fabric is to be thoroughly swabbed.

4. Protecting Footing Waterproofing: Concrete Walls:

In case the wall is to be of concrete, lay two 6-inch wide by 2-inch thick planks, the inner edge of which come to the wall line, these planks to thoroughly cover the fabric and be fastened together with cleats. The space intervening between these planks—which should be the width of the finished wall—is to be coated with a one-inch protective coat of cement mortar. When the forms are set for the wall the cleats should be removed but the planks left in place and the wall forms set on them.

When the wall forms are removed, these planks may be removed with them, great care being taken to see that the lap extending on either side of the wall is not damaged by nails or the dropping of any planks or girders on the lap.

Brick Walls:

Before any laying of brick is commenced, two planks must be laid, one on either side of the contemplated wall line, these planks to be 6 inches wide and 2 inches thick. They are to be fastened together by wire across the opening. The space representing the width of the wall is to be trowelled 1 inch thick with cement mortar, great care being taken not to displace the plank protection in this operation.

Then the brick wall is to be built on top of this plaster coating, the plank being allowed to remain in place until this wall is entirely finished and all brick and debris removed from the site.

Then these planks may be removed from over the Waterproofing and the work of waterproofing the walls be begun.

5. Wall Waterproofing:

First: The 6-inch lap already left laying on the outside of the wall line is to be turned up and sealed to the wall with a swabbing of GF No. 20. Then the Waterproofing course is to be applied as hereinafter specified.

If Either GF No. 15 Trowel Coating or GF No. 16 Foundation Brush Coating are to be used before the First Coat of Waterproofing Mastic is Applied:

First: After the masonry surface has been thoroughly dried and cleaned of projections and foreign matter, an under coating of GF No. 15 or 16 is to be applied over the entire surface to be waterproofed. After this coat has thoroughly set, the surface is to be thoroughly swabbed with a good even coat of GF No. 20 applied at such a degree of heat that it does not lump but spreads evenly over the surface. Then a layer of GF No. 21 Saturated Fabric is to be immediately imbedded in this hot coating and carefully pressed down so there are no wrinkles or ridges.

Then proceed as hereinafter specified under second swabbing.

Where the GF No. 20 Waterproofing Mastic is to be Applied Directly to the Surface of the Masonry:

First: After the masonry surface has been thoroughly dried and cleaned of projections and foreign matter, the surface is to be thoroughly swabbed with a good even coat of GF No. 20 applied at such a degree of heat that it does not lump when it comes in contact with the cold masonry but spreads on smoothly; then a layer of GF No. 21 Saturated Fabric is to be immediately imbedded in this hot coating and carefully pressed down so that there are no wrinkles or ridges.

(Note: A common street sweeper's broom is a very good thing to press the fabric into place with.)

Second: Swab this layer of fabric with a thorough coating of GF No. 20, then lay another thickness of GF No. 21 over the full width of the sheet already placed, and mop this thoroughly with another coating of GF No. 20.

Specifications—Continued

Third: The next layer of fabric is to be lapped over two-thirds of its width over the preceding layer of fabric just mopped and is to be mopped in the same manner.

Fourth: The next layer of fabric is to be lapped over two-thirds of its width over the preceding layer of fabric already placed and mopped in the same manner.

This method of procedure is to be continued until the whole surface is covered. After the entire surface to be waterproofed has been covered, all flashings and joints made, the entire top surface of the fabric is to receive a thick mop coating of the GF No. 20 applied hot.

6. Laying Waterproofing Over Floors:

After the concrete underbed has been cleaned and all depressions filled up with cement mortar and the same is perfectly dry, the first ply of Waterproofing shall be laid as heretofore specified, great care being taken that a firm joint is made between this layer and a lap of 6 inches left extending on the inside of the wall.

7. Protection of Waterproofing:

After the Waterproofing course over the floor or over the side walls has been finished, it shall be protected with a 1-inch thick plaster coat of 1:2 cement mortar applied directly over the last swabbing of GF No. 20.

A single course of brick may be used to protect the side wall Waterproofing. In case brick is used great care should be taken in the laying, to be sure that the Waterproofing course is not punctured.

8. Connecting Waterproofing to Pipes, Conduits, Etc.:

All pipes, conduits, etc., passing through the Waterproofing are to have copper flanges extending 8 inches out on floors and 5 inches up on pipes or conduits. After Waterproofing is installed these flanges are to be placed, sticking the under surface of the flange to the Waterproofing with hot GF No. 20 and soldering the top to the conduit or pipe. Then apply over these flanges three plies of Waterproofing solidly stuck to the flanges, coated, and extended 8 inches out on floor Waterproofing.

9. Flanges for Hot Water and Steam Pipes:

In the case of hot water or steam pipes the flanges must be of iron and the pipes threaded so that the flanges can be screwed onto the pipes, using red lead to render the screw joints water-tight. After the flanges have been screwed in place these lower edges should be waterproofed with 3 plies of Waterproofing solidly stuck to the flange of the flange and the Waterproofing carried out over the floor at least 8 inches.

Waterproofing Against Heavy Pressure in Conjunction with a Drainage System

General: Sections 1 to 9 inclusive are to be carefully followed, and

10. Draining:

Sufficient drainage gutters or hollow tile drains must be installed to lead out all water. They must all lead to a sump pit in which is installed an automatic or steam pump for the purpose of ejecting the water drained to this pit.

11. Flashing at Top of Wall:

After the wall Waterproofing has been finished up to the desired height, a lap of 4 inches is to be left so that the Waterproofing can be turned back into the wall 4 inches at grade level to prevent water seeping in over the top of the Waterproofing.

12. Permanent Sump Hole:

The rim for this permanent sump hole should either be furnished with a cast iron flange or some type of metal flange firmly attached to it by a waterproofed joint, so that the Membrane Waterproofing may be flashed to either side of this projection on the rim to afford a perfectly waterproof joint along the sides of the sump hole.

Heavy Pressure without the Installation of Drainage System, to be Waterproofed Against

General: Sections 1 to 12 to be carefully followed, and

13. Protecting Wall:

Before the protecting wall is laid a 1-inch coat of cement plaster should be applied over the entire course of Waterproofing. In laying the protecting wall, great care is to be taken not to injure the Waterproofing and all joints of the brickwork are to be well filled with mortar, having the latter rather wet and using a shove joint.

Specifications—Continued

Leaky Basement, Boiler Pit or Elevator Pit to be Waterproofed

General: Sections 1 to 13 are to be carefully followed, and Method No. 1

14. Wall Construction:

First: Build an outer wall 12 inches thick and 3 feet in height; then set back from the inner face 4 inches and built 3 feet more of wall; then set back again from the inner face 4 inches and build 3 feet more in height.

Second: Apply a Waterproofing course consisting of 2 ply of GF Nos. 20 and 21 to the inner face of the wall in accordance with section 5, extending it across the full width of the footing on the inside and carrying it out across the full width of the wall at the top.

Third: Protect the Waterproofing with a 1-inch plaster coat as herebefore specified and build against this a wall of the same height as that already built, with the necessary additional brickwork to bring the wall to the required thickness.

Fourth: Bring the lap of the Waterproofing across the top of the wall to the inner edge.

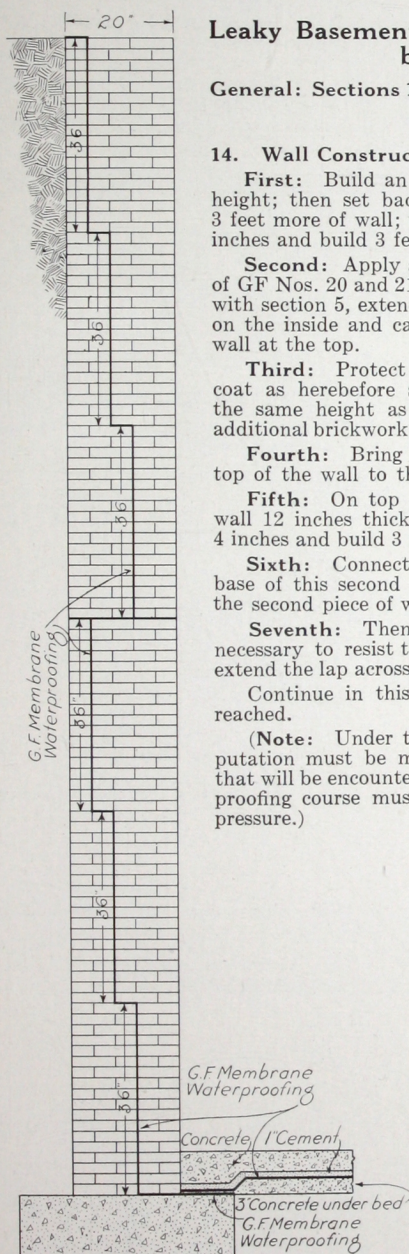
Fifth: On top of the wall already built, build an outer wall 12 inches thick, 3 feet in height as before; then step back 4 inches and build 3 feet; step back 4 inches and build 3 feet.

Sixth: Connect the lap of Waterproofing left at the base of this second wall and extend it up the inner face of the second piece of wall and lap on top as before.

Seventh: Then build the additional thickness of wall necessary to resist the pressure against the Waterproofing and extend the lap across the entire wall.

Continue in this manner until the full desired height is reached.

(Note: Under the conditions mentioned, a careful computation must be made of the greatest hydrostatic pressure that will be encountered and the wall on the inside of the Waterproofing course must be of sufficient strength to resist this pressure.)



Specifications—Continued

Method No. 2

15. Reinforcing Waterproofing:

After sections 1 to 13 have been complied with, the Waterproofing is to be carried up the inner face of wall to grade level and then protect it by retaining walls of masonry 8 inches in thickness to one-half the height and 4 inches in thickness to the balance of the height of the wall.

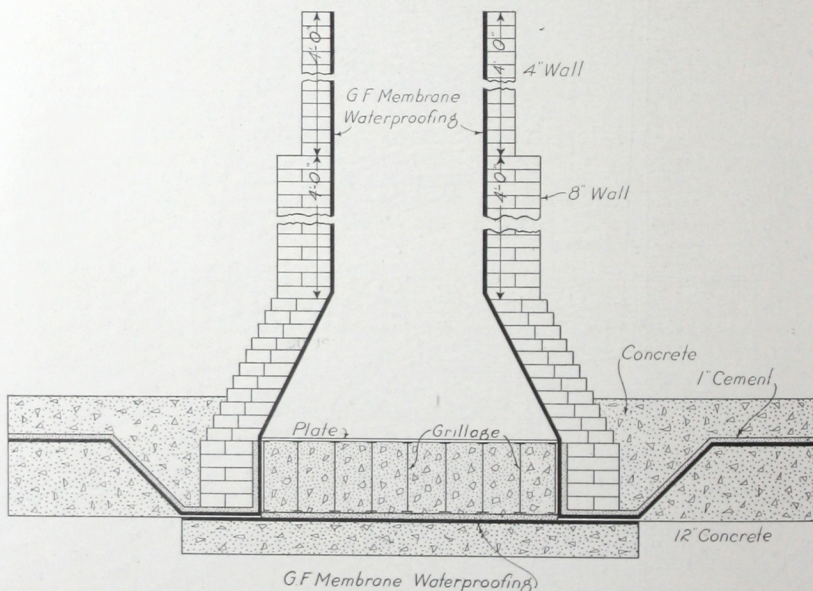
Waterproofing Around Columns and Under Grillages

16. Waterproofing Course:

After the surface to be waterproofed has been prepared in accordance with sections 1 to 4 and 6 and before the grillages are set, 3-ply of GF No. 21 and 4-ply of GF No. 20 are to be laid on the bed where these grillages are to be set, extending the Waterproofing out over the full size of the column footing. The whole layer of Waterproofing is to be thoroughly protected with a 1-inch coat of Portland Cement Mortar.

17. Filling Column Shoes:

After the columns are set the shoes are to be filled solid with Portland Cement Grout, the rivet heads plastered over even and smooth and the underbed of floor concrete properly smoothed and graded with Portland Cement. Then lay the



Waterproofing over the floor connecting it to the lap under the grillages, after freeing this lap of the Portland Cement Mortar Coating, and extend the Waterproofing up the columns to the desired height above the floor. (This should be at least 12 inches above the highest water level.)

18. Protecting Brickwork:

Then build protecting brickwork against the Waterproofing around the column at least 8 inches in thickness for the first 4 feet in height and 4 inches in thickness for the balance. After this work is completed the finish course of concrete may be laid over the entire floor.

Specifications—Continued

(Note: The hydrostatic heads to be resisted must be computed and the brickwork surrounding this Waterproofing made of sufficient strength to resist the entire water pressure.)

Waterproofing Around Columns:

19. Preparation and Application of Waterproofing:

After the underbed of floor concrete is properly graded and smoothed off with Portland Cement Mortar and the rivet heads are all plastered, the Waterproofing is to be laid over the entire floor extending same up columns to a height of 2 to 5 feet (if necessary to extend higher, use method specified in sections 16 to 19). Protect the same with 1 inch of Portland Cement Mortar. Then build 4 inches of brickwork against Waterproofing and lay finish course of concrete over entire floor.

Built-up Roofs over Concrete, Wood or Flat Tile

20. Concrete Roof:

The surface of a concrete roof over which Waterproofing is to be applied should be screeded as smoothly as possible. Over the entire surface lay 2-ply (or 1-ply if desired) of GF No. 20 Waterproofing Mastic and GF No. 21 Saturated Fabric. This is to be laid in accordance with sections 1, 2, 6 and 7.

21. Wood Roof:

Where Waterproofing is to be laid over the surface of wood roofs, the surface of the wood should not be coated but be covered with a layer of building paper lapped at least 2 inches and every lap nailed with roofing tins and nails 5 feet on centers. Then apply the Waterproofing in accordance with sections 1, 2, 6 and 7.

22. Tile Roof:

In case tile is to be laid over the Waterproofing, a bed of cement mortar not less than 1 inch in thickness, waterproofed with GF No. 10 Integral Waterproofing Paste, should be laid over the final coating of GF No. 20 and into this the tile should be embedded, bringing them up to a true and even surface. The joints between the tile are to be one-quarter inch in width and filled with Portland Cement Grout waterproofed with GF No. 10 Integral Waterproofing Paste.

23. Slag or Gravel:

In either case where the finish of the roof is to be of slag or gravel it is to be applied at the same time as the final coating of GF No. 20. The GF No. 20 to be applied thickly, pushing into it as much as possible of the slag or gravel, in no case less than 400 pounds of slag or 500 pounds of gravel per square. The gravel or slag, whichever is used, must be perfectly dry. If necessary it is to be heated to obtain this result.

24. Expansion Joints:

If expansion joints are required, they should be not less than 1 inch in width and be filled with GF No. 250 Mastic Cement.

Floor Construction of Mills, Garages, Stables, Etc.

25. Wood Floors:

If gutters are required, wooden boxes are to be constructed at least 2 inches wider and 2 inches deeper than the depth and width of the iron gutters, so that there may be a space for applying the Waterproofing (see sketch page 36). Over the wood underfloor lay one ply of GF No. 21 Saturated Fabric, lapping the edges 2 inches and nailing well with flats and nails.

Swab this layer of fabric thoroughly with GF No. 20 in which is to be immediately imbedded another layer of GF No. 21 the joints of which are to lap the joints of the layer already put down. The top surface of this second layer of GF No. 21 is to be thoroughly swabbed with GF No. 20 according to sections 1, 2, 6 and 7. This Waterproofing is to be extended down and around sides and bottom of gutter boxes.

After the iron gutters are installed, fill in under them with hot GF No. 20 so that the entire space shall be solid.

Specifications—Continued

26. Laying Sleepers for Finished Floor:

The sleepers for the finished flooring are to be laid and nailed at the same time the surface coating of GF No. 20 is being applied, the carpenters working with the waterproofers to the end that the sleepers may be embedded in the hot GF No. 20 Waterproofing Mastic, and a thorough junction made between the coating and the nail so there will be no leaks where the nail punctures the Waterproofing course.

27. Concrete Floors:

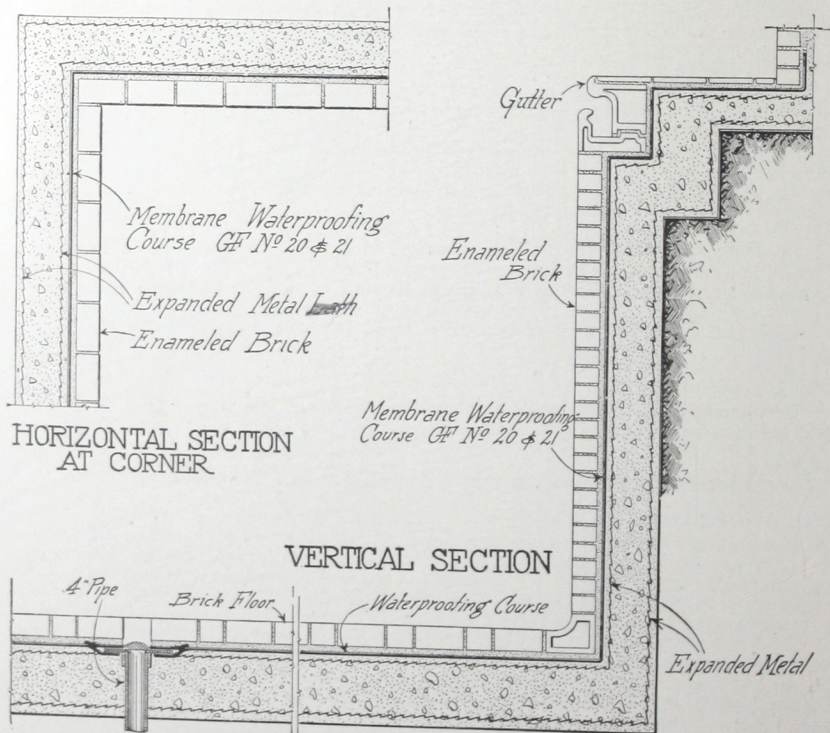
Form depressions in concrete underbed for iron gutters which are to have copper flanges on either side at least 6 inches in width. These gutters are to be set so that they will come to the proper level in relation to the finish floor. After the underbed of concrete is properly smoothed and graded with Portland Cement Mortar lay the Waterproofing over the entire floor, in accordance to sections 1, 2, 6 and 7, including the depressions for the gutters.

28. Setting Gutters:

Set the gutters so that the flanges will rest upon the Waterproofing and fill under the gutters solid with GF No. 20 Waterproofing Mastic. Then bring the copper flanges of the gutter down upon the Waterproofing. Then lay 3 plies of Waterproofing the full width of the flanges, lapping 8 inches out on floor Waterproofing.

29. Protecting Waterproofing:

Protect the entire surface of the Waterproofing with 1 inch of Portland Cement Mortar and after this has thoroughly set lay the finished concrete floor.



Details of Swimming Pool Waterproofing

Waterproofing Swimming Pools to Resist Inside Pressure

General: Sections 1 to 11 should be carefully followed, and

30. Application:

The Waterproofing course is to be carried over the floor and up the sides of the pool, lapping it over under the platform around pool and up the side walls at the edge of this platform at least 6 inches. Then the Waterproofing is to be covered with an inch coat of mortar before the concrete floor and sidewall or brick inner lining of the pool is placed.

31. Pipes:

All pipes or drains passing through the Waterproofing course are to have copper or screw flanges in accordance with sections 8 and 9.

Waterproofing Swimming Pool Against Inside and Outside Pressure

General: Sections 1 to 11 are to be carefully followed, and

32. Reinforcing Wall:

After the Waterproofing has been applied to the outer wall which shall be of sufficient strength to withstand the entire pressure of water on the inside of the pool, another wall is to be set inside the Waterproofing of sufficient strength to withstand the entire pressure of the water from the outside. Before this wall and floor are set in place the Waterproofing must be thoroughly protected with an inch plaster coat of Portland Cement Mortar.

Waterproofing Steel Deck or Concrete Floor Railroad Bridges

General: Sections 1, 2 and 6 to 9 inclusive are to be carefully followed, and

33. Construction:

A. Depth: The depth of the steel or concrete construction shall be sufficient from the top of the rail to the top of steel or concrete floor to allow of the installation of sufficient protection of concrete or brick to prevent cutting the Waterproofing by the action of the ballast.

B. Drainage: The surface to which the Waterproofing is applied shall be pitched so that all water washing down through to the Waterproofing may be removed promptly. Where this is not done in the steel, concrete shall be laid so as to drain the water to the inlets.

C. Inlet: Cast iron inlets shall be set at proper places in the floor and provided with movable grated covers. The down spout from these inlets shall be provided with traps and clean-outs which shall be accessible from below the bridge.

D. Half-through Girder: Where the top of the girder approximates the same height as the top of the rail, the Waterproofing and protection shall cover the entire top of the girder.

E. Apron-plate: The apron-plate from the steel floor over the back wall shall be provided with a curb angle against which to finish the Waterproofing, and to this angle shall be riveted a vertical plate to prevent dirt from collecting under the apron-plate. The apron-plate shall slide freely on the backing wall either over a downward curved surface or a flat.

Specifications—Continued

34. Protection of Waterproofing:

After completion of the Waterproofing the entire surface shall be covered and protected by one of the following methods:

First: Straight hard burned brick laid flat, with the joints filled either with GF No. 20 or with cement grout in which has been incorporated GF No. 10 Integral Waterproofing Paste.

Second: A layer of concrete from 2½ to 3 inches thick with GF Wire Fabric Reinforcement.

35. Preparation for Waterproofing:

A. Concrete: Wherever called for by the plans the decks of the bridge shall be protected with 1:3:5 concrete mixed as specified and finished with 1:2 cement mortar ½ inch thick troweled to a smooth, even surface as shown. This concrete and mortar shall be allowed to dry thoroughly so as to prevent the formation of steam when the hot Waterproofing is applied.

B. Cleaning: All vertical or sloping surfaces of concrete or steel shall be thoroughly cleaned of dust, dirt, loose particles, paint and grease. The use of a hand bellows is recommended for cleaning off loose sand and dirt. For cleaning paint and grease and freshening the surface of the GF No. 20 where a junction of old and new is to be made, or where a pocket of GF No. 250 Mastic Cement is to be used against the girders, gasoline shall be used. This may be done either by swabbing the surface with it, or, where steel is to be cleaned, pouring a small quantity over the surface to be cleaned and setting fire to it. The use of a blow torch is also recommended.

C. Painting Steel and Concrete: The surface shall then be painted with 2 coats of GF No. 200. The material for the first coat shall be diluted with gasoline so as to give a brownish tint. The second coat shall leave the surface a very dark brown—almost black. Both coats of paint shall be carefully applied and thoroughly worked into the surface, to give a uniform coating.

Paint shall not be applied to damp concrete or steel. The paint is to be applied immediately in advance of the Waterproofing and before dust and dirt have a chance to collect after the cleaning.

D. Pouring Concrete: All concrete shall be poured as the chief engineer shall direct. It shall be of such consistency that when placed it will not require much tamping and shall be laid to aid the watertightness of the structure, not merely as a support for the Waterproofing materials. All exposed surfaces shall be trowelled to a smooth, hard finish.

In cases where concrete haunching against girders is called for by the plans, forms shall be used, and the concrete shall be of a wet consistency.

36. Application of Waterproofing:

On the surface prepared as hereinbefore specified apply GF No. 20 Waterproofing Mastic and GF No. 21 Saturated Fabric in accordance with sections 1, 2 and 6 to 9 inclusive.

All flashings and reinforcing around inlets and other places specified shall be carefully executed.

Waterproofing shall not be done in wet weather nor at a temperature below 32 degrees Fahrenheit without special orders from the chief engineer. The Saturated Fabric shall be laid shingle fashion transversely to the center line of the bridge and shall be carried up the haunching and secured against the girder by the use of an angle bolted through the girder and over the Waterproofing as shown.

GF No. 16 Foundation Brush Coating

Waterproofing substructural work against moisture and ordinary surface drainage can be done economically with a foundation brush coating. Such a coating, when brushed thoroughly into all the pores and small reveals in a brick, masonry or concrete foundation, effectively repels any dampness or seepage except that from a direct head of water.

It must, however, be thin enough to spread readily under the brush and must bond thoroughly, at the same time remaining pliant to expand or contract with the wall and not crack or scale off.

GF No. 16 Foundation Brush Coating is a heavy bitumen of such consistency that it can be applied cold with an ordinary paint brush. It bonds tightly to the wall, but yields to expansion or contraction without danger to the tough film which makes up the waterproofing agent. GF No. 16 Brush Coating, in connection with a reinforcing layer of felt or burlap, is sometimes used to meet even more severe conditions than natural soil drainage presents.

To thoroughly protect sub-structures against surface drainage and the absorption of moisture through capillary attraction the waterproof course must extend over the footings and on top of the underbed of the concrete floor, as well as on the outside of walls in contact with surrounding soil. For this work the use of GF No. 16 is the most economical method. It does not require heating and is very easily applied.

The covering capacity of GF No. 16 varies from 40 to 75 square feet of surface per gallon. So much depends on the nature of the surface to be covered, that a closer general estimate cannot be made.

Specifications for Applying GF No. 16 Foundation Brush Coating

General Conditions:

1. Material:

GF No. 16 Foundation Brush Coating, as manufactured by The General Fireproofing Company, Youngstown, Ohio, is to be purchased direct from the manufacturers or their authorized Agents and is to be delivered on the building site in original sealed packages. It is to be applied without addition or adulteration.

2. Preparing Surfaces:

Surfaces to be coated are to be clean, dry and wire brushed to be sure that they are free from all loose particles of mortar, etc.

3. Drainage:

Whatever water is present must be carried away by drainage or pumping so as to maintain the work in an absolutely dry condition.

Seepage and Natural Soil Drainage

4. Application:

After the surfaces have been thoroughly cleaned and are absolutely dry, apply two thorough covering coats of GF No. 16 over the footing course and through the key in the following manner:

First: Coat the entire footing and imbed in this coating a layer of GF Waterproof Felt, allowing same to lap at least 6 inches either side of the wall line.

Second: Coat this Felt with a thorough coating of GF No. 16, taking care that the Felt is not displaced in the operation.

Third: After the foundation wall is set the lap on the outside of the footing is to be turned up and stuck to this wall with a coating of GF No. 16, after which two thorough covering coats are to be brushed over the outside of the wall up to grade.

Specifications—Continued

5. Connecting Lap:

Great care must be taken to obtain a perfect connection to the lap through the footing.

6. Floors:

After the rough concrete floor has been prepared, two thorough covering coats of GF No. 16 are to be brushed over this surface, connecting with the laps through the footing and the finished floor laid over this coating. (The finish floor in no case to be less than 3 inches in thickness.)

Dampproofing Interior Face of Walls before Erecting Metal Furring and Lathing, or Tile or Hollow Brick Furring

7. Application:

Two thorough covering coats of GF No. 16 are to be applied over the entire face of all exposed walls, carrying the coating into all recesses and reveals and out on all connecting partitions and ceilings at least 18 inches from the side walls.

Then erect the metal lath or tile furring as usual.

Waterproofing Tanks, Cisterns, Etc.

8. Application:

After the surfaces have been prepared in accordance with sections 1 to 3 inclusive, 2 thorough coats of GF No. 16 are to be applied to the side walls and floors of (name whether cisterns, tanks, etc.) and then this material is to be protected with a lining of either plaster, brick, tile or some other covering to protect it against abrasion.

GF No. 15 Trowel Coating

Where a considerable water pressure must be combatted on sub-structural work, or where the walls to be waterproofed offer very uneven surfaces, a liquid compound cannot be used effectively. The waterproofing element should have a heavier body which will offer resistance to pressure, and fill all the pores or other irregularities in the wall.

The coating applied must be soft enough so that it works readily into these small holes and bonds thoroughly, with enough elasticity in itself to meet natural expansion and contraction without cracking or crumbling off.

GF No. 15 Trowel Coating is made with the same high grade bituminous base as GF Nos. 16 and 200 and with just enough body to give it a stiff, putty-like consistency. It can be used either above or below grade and is especially effective for waterproofing rough walls, whether stone, concrete or brick.

It bonds tightly to the surface and possesses elasticity to meet any ordinary variations in walls. The finished coating is waterproof, and also repels the acids which are frequently present in ground water.

GF No. 15 is very easily applied and can be put on by anyone familiar with the use of a trowel. It does not stick to the trowel, but works as smoothly as Gypsum plaster. An ordinary workman can easily cover from 600 to 800 square feet per day, depending on the thickness of the coat to be used.

Covering Capacity

Coating 1/16" thick	26 sq. ft. per gallon
Coating 1/24" thick	38 sq. ft. per gallon
Coating 1/32" thick	51 sq. ft. per gallon

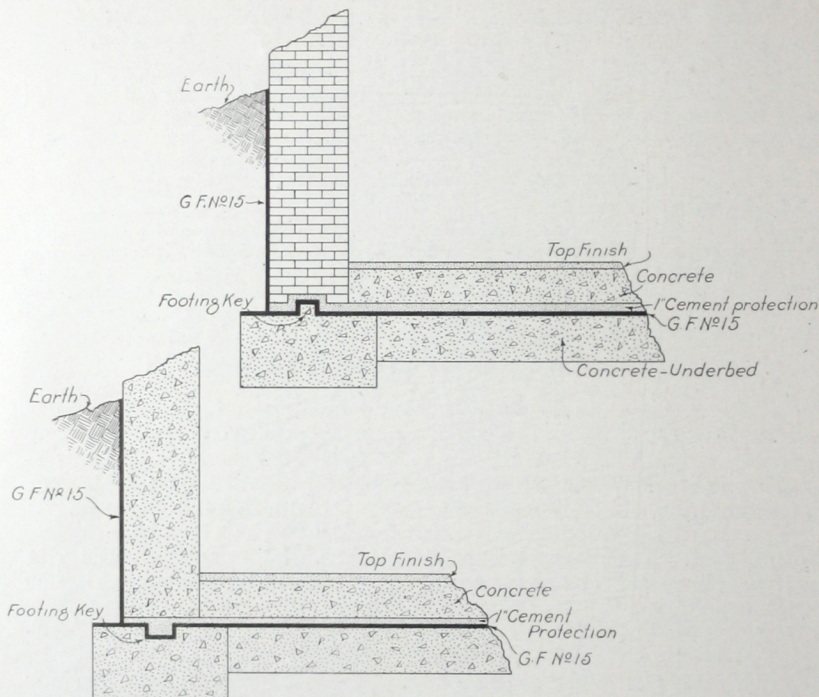
Specifications for Applying GF No. 15 Trowel Coating

1. Material:

GF. No. 15 Trowel Coating as manufactured by The General Fireproofing Company, Youngstown, Ohio, is to be purchased direct from the manufacturers or their authorized Agents, and is to be delivered on the building site in original and sealed packages. It is to be applied without adulteration or addition.

2. Preparing Surfaces:

After (mention surfaces) are thoroughly cleaned and dry, the coating may be applied.



3. Drainage:

Whatever water is present must be carried away by drainage or pumping so as to maintain the work in an absolutely dry condition.

Seepage and Natural Soil Drainage—Waterproofing Against

4. Footing Course:

After the surfaces have been prepared in accordance with Sections 1 to 3, apply with a trowel over the footing course a coating of GF No. 15 not less than $\frac{1}{16}$ inch thick. Cover this with one layer of GF No. 18 Waterproof Felt, allowing the latter to project on both sides of the wall at least 6 inches beyond the line of the foundation wall to be erected on the footing. Then this protecting layer of GF No. 18 Felt is to be covered with a coating of GF No. 15 $\frac{1}{16}$ inch thick.

5. Wall Waterproofing:

After the foundation wall is set, the lap on the outside of the footing is to be turned up and stuck to this wall with a coating of GF No. 15, after which a coating $\frac{1}{16}$ inch

Specifications—Continued

thick is to be trowelled over the entire outside of the wall up to the grade line. Take great care that a perfect connection is made with the lap through the footings and turned up on the outside of the wall.

6. Floor Waterproofing:

After the rough concrete floor has been prepared, a trowel coating $\frac{1}{16}$ inch thick and connecting with the lap through the wall over the footing must be applied over the entire floor before the finish floor is laid.

(Note: The finish floor in no case to be less than 3 inches in thickness.)

High Pressure of Water in Conjunction with Drainage System

General: Sections 1 to 6 inclusive are to be carefully followed, and

7. Sump Pits:

Before actual waterproofing can be commenced, it is necessary to build a permanent sump pit into which all the water shall be drained by means of trenches filled with broken stone or porous tile drain pipe covered with a sheet of Waterproof Felt, over which the Waterproofing is to be carried. Provision must be made for the ejection of water collected in the sump pit, by means of a pump or otherwise, to keep the substructures free from all pressure.

Sealing Intersection of Wall and Ceiling in Fireproof Construction Before Dampproofing

General: Sections 1 and 2 are to be carefully followed, and

8. Application:

Apply a $\frac{1}{16}$ inch thick coating of GF No. 15 with a trowel on the under side of floor slab and down the inside face of exposed walls for a distance of not less than 6 inches from the ceiling angle. From this point apply GF No. 200 Dampproofing Coating.

Dampproofing Interior Face of Walls Before Erecting Metal Furring and Lathing, or Tile or Hollow Brick Furring

General: Sections 1 and 2 are to be carefully followed, and

9. Application:

Trowel a thorough coat of GF No. 15 over the entire wall, carrying it into all recesses and reveals and out on all connecting partitions and ceilings 6 inches from side wall. Then erect the Metal Lath or Tile Furring as usual.

Waterproofing Parapet Walls and Under Copings

General: Sections 1 and 2 are to be carefully followed, and

10. Application:

Apply to the inside face of all parapet walls a trowel coating of GF No. 15 not less than $\frac{1}{16}$ inch thick, carrying this coating over top of wall before the cement bed for the coping is laid. This coating should be carried under all cap and base flashings and used as a flexible filler for the joint of the cap flashing.

Underbedding Wood or Concrete Under-Floors of Mills, Garages, Stables, Etc.

11. Wood Floor:

Where GF No. 15 Trowel Coating is to be applied over wood under-floors, first nail down rosin sized sheathing paper to present a continuous surface to receive the Waterproofing. Trowel over the entire floor surface GF No. 15 Trowel Coating not less than $\frac{1}{16}$ inch thick, taking care to make same level as well as continuous.

Specifications—Continued

This coating to be carried down the sides of gutters and depressions and up side walls, columns, etc., to a height not less than one inch above finished floor level.

12. Concrete Floor:

After the rough concrete floor has been prepared, a trowel coating $\frac{1}{8}$ inch thick is to be applied over the whole surface, carrying it down the sides of gutters and depressions and up side walls, columns, etc., to a height not less than 1 inch above finish floor level.

Flat Tile in Roof or Floor Construction to be Waterproofed

General: Sections 1 and 2 are to be carefully followed, and

13. Wood Base:

Where the coating is to be applied over wood, first nail down rosin sized sheathing paper to present a continuous surface to receive the Waterproofing.

14. Concrete Base:

Where the coating is to be applied over concrete, this concrete must be cleaned and thoroughly dried before application of GF No. 15.

15. Grading:

The surface to which the GF No. 15 is to be applied, whether of concrete or wood, must be properly graded to all outlets without any depressions.

16. Application:

Trowel GF No. 15 Trowel Coating over the surface to a thickness of $\frac{1}{2}$ inch, bringing it to a smooth and even surface. Upon this coating lay a bed of cement mortar 1 inch in thickness waterproofed with GF No. 10 Integral Waterproofing Paste into which the tile are to be bedded, care being taken to bring the tile up to a true and even surface. Joints between the tiles are to be $\frac{1}{4}$ inch in width and filled with Portland Cement Grout waterproofed with GF No. 10 Integral Waterproofing Paste.

17. Expansion Joints:

Where expansion joints are required, they should be left not less than 1 inch in width and pointed with GF No. 250 Mastic Cement of the same color as the tile being used.

GF No. 220 Stainproof Stone Backing

Wherever limestone, marble and other light colored and expensive building stones are used it becomes necessary from the standpoint of economy and beauty to protect them against unsightly stains, which often appear. These stains are caused by the absorption of salts and other coloring matter from the backing walls and will invariably work through to the surface unless the stones themselves are carefully stainproofed.

That architects realize the danger from this source is evidenced by the fact that they almost invariably specify a non-staining cement for the setting of such stones. These are good as far as they go, but it has been demonstrated time and again that to protect stone from stains from the cement mortar used in laying the backing, some means must be used not only to repel dampness but acids and alkalies as well.

GF No. 220 Stainproof Stone Backing seals the pores of the stone tightly, which is the only sure method of making them absolutely water and stain proof.

GF No. 220 Stainproofing is also used as an extra precaution in conjunction with non-staining cement or lime, because its strong moisture-repelling qualities overcome the staining tendency of unevenly applied cement.

It does not contain penetrating oils of any kind—in fact, GF No. 220 simply lays on the surface of the stone forming a strong film which thoroughly seals all the surface pores.

Covering Capacity

First coat.....	75 to 100 sq. ft. per gallon
Second coat.....	125 to 150 sq. ft. per gallon
Two coats.....	50 to 65 sq. ft. per gallon

**Specifications for Applying
GF No. 220 Stainproof Stone Backing**

1. Material:

GF No. 220 Stainproof Stone Backing as manufactured by The General Fireproofing Company, Youngstown, Ohio, is to be purchased direct from the manufacturers or their authorized Agents, and is to be delivered on the building site in original and sealed packages. This material must be applied without addition or adulteration.

2. Preparing Surfaces:

The surfaces of the stone to be coated are to be cleaned and dried thoroughly before receiving the coating.

**Limestone, Marble, Sandstone, Etc., to be Protected
Against Stains**

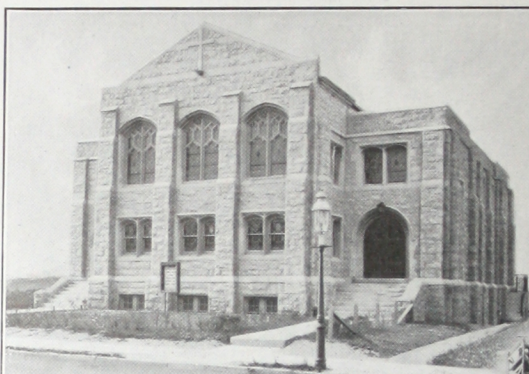
3. Application:

All unexposed faces of the stone to be thoroughly covered to within 1 inch of the edge of the face with two coats of GF No. 220 Stainproof Stone Backing, 24 hours to elapse between coats.

The coating thus applied must become completely dry before the stones are handled.

4. Coating Stone After Erection:

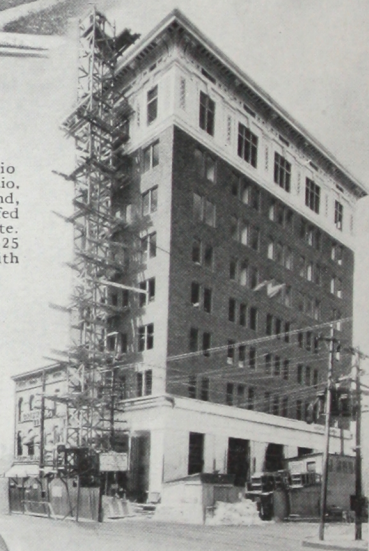
After the stones have been set in place, and before the backing has been carried up, the entire surface, including joints, should be given a thorough covering coat of GF No. 220, great care being taken to see that all joints are thoroughly coated.



Tabernacle Lutheran Church, Philadelphia. Architect, E. J. Willing, New York City. Contractor, E. J. Kreitzburg, Philadelphia, Pa. Gable waterproofed with GF No. 100 Colorless Waterproofing for Exterior.

Western Reserve Bank, Warren, Ohio. Architect, C. F. Owsley, Youngstown, Ohio. Contractors, The Geo. A. Fuller Co., Cleveland, Ohio. Concrete Foundation waterproofed with GF No. 10 Integral Waterproofing Paste. Structural Steel protected with GF No. 325 Protective Coating. Floor hardened with GF No. 140 Concrete Hardener.

Morristown Court House, Morristown, Pa. Architects, Schermerhorn & Reinhold, Philadelphia, Pa. Contractors, H. Miller & Son, Pittsburgh, Pa. Areaway beneath building and street waterproofed with GF No. 10 Integral Waterproofing Paste in plaster coat.



GF No. 200 Dampproofing Coating

Dampproofing Coatings are applied to walls which are later plaster finished, for two reasons. First—to maintain sanitary quarters which are not possible when dampness gets through into the atmosphere of the room or is constantly present in the walls. Second—to prevent streaking and discoloration due to moisture seeping through along the line of the furring.

The application of this dampproofing material directly upon the surface to be plastered makes necessary a compound with a strong “tack” to aid in bonding the plaster. And the dampproofing to be effective must expand and contract with the wall itself without cracking. Further than that, permanent dampproofing qualities are necessary, for a job once finished cannot be repaired or renewed without great cost.

GF No. 200 is a viscous black coating which is applied with a brush—not to the permanently exposed surfaces, but as a furring coating between the wall and the finished surface. It has the tough, elastic characteristics of any strong bituminous base, which adapts it to expansion and contraction without injury and keeps it from drying out and becoming brittle.

The strong “tack” of GF No. 200 when set is retained for a period of 30 days so that it may be plastered upon any time from a day to a month after application with equally good results. Where the coating is used for dampproofing exterior walls, it is best to apply the first scratch coat of cement mortar in from one to four days.

As an insulator to maintain uniform temperature and dry air in a building GF No. 200 Dampproofing Coating is applied to the rough wall before the furring is put up. This keeps the air space formed by furring dry at all times, affording the best possible insulator against the passage of heat, cold and dampness.

Applied for protecting either exterior or interior wall finish GF No. 200 prevents efflorescence and staining by effectively barring the moisture which combines with salts and alkali in mortar to cause these forms of discoloration, and where wood trim is erected over green masonry or walls which may become damp. Occasionally, a coating of GF Dampproofing on the back of the trim will prevent warping, cracking and staining.

In all of the uses named above GF No. 200 forms an easily applied and absolutely permanent waterproof film. The average covering capacity of GF No. 200 as listed varies with the smoothness of the surface being covered.

First Coat.....	75 sq. ft. per gallon
Second coat.....	100 sq. ft. per gallon
Third coat.....	45 sq. ft. per gallon

Specifications for Applying GF No. 200 Dampproofing Coating

1. Material:

GF No. 200 Dampproofing Coating as manufactured by The General Fireproofing Company, Youngstown, Ohio, is to be purchased direct from the manufacturers or their authorized Agents, and is to be delivered on the building site in original sealed packages. It must be used without the addition of any thinning agents or any adulteration.

2. Caution:

Great care must be taken in the application of this coating to see that no pin-holes remain and that a thorough covering coat is obtained.

3. Pointing:

All large holes must be pointed up to provide a surface to receive the Dampproofing.

4. Number of Coats:

Two thorough covering coats of GF No. 200 are to be applied to (name surface), 24 hours being allowed between coats. These coats must be absolutely continuous and perfect in every respect.

(Note: While a thorough job of Dampproofing can be successfully done with one coat of GF No. 200, the specifications call for two coats because the success of the work depends on the surface being absolutely covered. This is difficult of accomplishment with one coat because of the fact that the brick masons do not lay a wall absolutely devoid of holes, and the man applying the coating cannot be depended upon to fill up these holes and crevices with the Dampproofing. Where two coats are called for, it is practically certain that the second coat will cover any voids that may have been left in the first coat.)

Inner Face of Brick, Stone or Terra Cotta Walls, Etc.

General: Sections 1 to 4 are to be carefully followed, and

5. Application:

The interior faces of all weather exposed walls (mention whether brick, stone or terra cotta) are to be thoroughly coated with 2 coats of GF No. 200 Dampproofing Coating, allowing 24 hours to elapse between coats. Twenty-four hours is to elapse after the second coat is applied before any plaster is applied over the coating. The coating is to be carried into all chases and reveals and well brushed into all recesses and joints—in a word, the entire Dampproofing Coating must be continuous.

6. Intersecting Angles:

The intersecting angles of all brick or terra cotta walls and terra cotta or concrete floor slabs coming in contact with weather exposed walls should be carefully coated, the coating being carried out from the wall not less than 18 inches on all such intersecting walls or floor slabs.

The best material for treating this intersecting angle between the wall and floor slab is GF No. 15 Trowel Coating. This material should be applied to the floor slab and the side wall 6 inches out and down from the intersecting angle at the ceiling.

7. Plastering:

Plaster may be applied over surfaces covered with GF No. 200 Dampproofing Coating within an interval of from 1 to 30 days.

Dampproofing Exterior of Hollow Tile Walls Before Applying Cement Plaster

General: Sections 1 to 4 inclusive are to be carefully followed, and

8. Application:

After the joints between the porous terra cotta blocks have been thoroughly pointed, apply 2 coats of GF No. 200 Dampproofing Coating over the entire surface

Specifications—Continued

of the terra cotta blocks, brushing thoroughly into all groves and over all joints. The Coating must be allowed to cure for 24 hours after the second coat is applied before any cement plaster is put onto the surface.

(Note: While GF No. 200 Dampproofing Coating is adaptable to porous terra cotta blocks, it should never be used on vitrified blocks. The most effective treatment in the latter case would be to incorporate GF No. 10 Integral Waterproofing Paste throughout the stucco with which the blocks are covered, or GF No. 10 Paste should be incorporated in the mortar with which the blocks are laid, or a waterproof surface coating may be used outside the stucco. For this purpose we would recommend the application of either GF No. 100 Colorless Waterproofing or GF No. 101 Brick and Cement Coating in colors.

Terra Cotta Ceilings and Partition Walls to be Stainproofed and Dampproofed

General: Sections 1, 2 and 4 are to be carefully followed, and

9. Raking Joints:

All joints are to be raked out to a depth of $\frac{1}{4}$ inch or $\frac{3}{8}$ inch before any coating is applied.

10. Chipping:

If the surface of tile is smooth (vitrified or salt glazed) roughen the surface by hacking with a chipping hammer.

11. Application:

Apply two thorough covering coats of GF No. 200 allowing 24 hours to elapse between coats. After the second coating of Dampproofing has set for 24 hours the scratch coat of plaster may be applied.

Trim in Contact with Plastered Surfaces or Masonry to be Dampproofed on the Back

General: Sections 1 and 2 are to be carefully followed, and

12. Application:

The back of all trim shall receive a heavy coat of GF No. 200 Dampproofing before it is erected. This coating may be applied either at the plant where the trim is manufactured or on the job immediately before it is erected.

GF No. 100 Colorless Waterproofing

(For Exteriors)

The use of stucco, stone and brick exterior walls on which it is necessary to retain the original color and texture creates the need for a transparent Waterproofing which can be easily brushed onto the surface. A similar coating is used also on parapets, over copings, etc., where it is impractical to carry a Waterproofing course which changes the appearance of the surface.

And where swimming pools and tanks are of a light color, a colorless waterproof protection is required to keep the surfaces from stain and discoloration, in addition to the waterproofing method used as a protection against both water and water pressure.

Good results are obtained only when the compound used is absolutely colorless and remains so; when it can be easily applied without showing a streak where the coat stops, and when the coating is hard enough to prevent dirt or dust from sticking to it, causing streaks and spots.

GF No. 100 Colorless Waterproofing is a thin liquid which is simply brushed onto the surface to be protected. It immediately fills the surface pores, forming a hard, durable coating that sheds water effectively and will not collect dirt or dust as coatings do which contain wax and paraffin.

With GF No. 100 the wall or other surface retains all of its original color and texture and when the Waterproofing is carried part way down a wall no water line is left where the coating ends. This permits the lapping of the colorless Waterproofing below the line where the inner wall Dampproofing ends and gives the best possible form of protection.

The use of GF No. 100 on exterior walls of stucco or cement block, fills the pores so completely that the soaked appearance after rain storms is overcome and there is no danger of frost cracks. It also prevents efflorescence and helps to check it when once started. This condition, however, is so serious on old buildings that exact conditions should be sent to the manufacturers of GF Waterproofing products and they will recommend the proper method of treatment in detail.

The covering capacity of GF No. 100 varies inversely with the porosity of the surface to which it is applied, but is approximately as follows:

Covering Capacity

First coat.....	100 to 150 square feet per gallon.
Second coat.....	200 to 250 square feet per gallon.
Two coats.....	80 to 100 square feet per gallon.

(Note: Where the surface covered need not retain its original color, a cement wash applied prior to the waterproof coating will increase the capacity per gallon. This serves to diminish the number of pores, cracks, and holes too small to be cared for by the "pointing up" process.)

Specifications for Applying GF No. 100 Colorless Waterproofing

General:

1. Material:

GF No. 100 Colorless Waterproofing as manufactured by The General Fireproofing Company, Youngstown, Ohio, is to be purchased direct from the manufacturers or their authorized Agents and is to be delivered on the building site in original and sealed packages. It must be applied as received without addition or adulteration of any kind.

2. Application:

The best results from the application of GF No. 100 are to be obtained when the temperature is above 70 degrees F. It must **not** be applied when the temperature of the wall is below 60 degrees Fahrenheit.

3. Pointing:

Before any coating is applied all holes, joints, etc., should be pointed up with cement mortar so as to present an even and perfect surface of masonry over which to apply the coating.

4. Cleaning:

The surface should be carefully wire brushed to remove all loose particles of mortar and any other foreign matter including dust.

5. Method of Coating:

In no case shall less than two coats of GF No. 100 be applied, and where the surface is very porous, apply as many additional coats as may be required to completely saturate the surface. Use a short handled, stiff bristle brush and apply the material with a force sufficient to drive it well into the surface. The more vigorous the use of the brush the better will be the results obtained from the coating.

(Note: The fact that the GF No. 100 is designed as a small pore filler and transparent coating explains why the application of a cement wash is advisable, when the surface is very open and porous, for the material itself has not enough body to really fill a hole or a crack as large as would admit a knife blade.)

Treatment of Extremely Porous Surface where Original Color Need not be Retained

General: Sections 1, 2, 3 and 4 are to be carefully followed, and

6. Preparation of Surface:

The wall shall be drenched with clear water and, while still wet, a thin cream made from Portland Cement and water is to be thoroughly brushed over this surface. As this coating is for the purpose of filling up the small cracks and holes too small to be pointed, great care must be taken that the cement cream is thoroughly brushed into all these small cracks and holes.

After this cement wash has thoroughly hardened and is absolutely dry, brush off such of it as refuses to adhere strongly to the wall. Then proceed with the application of the Colorless Waterproofing. Section 5.

Leaky Rough Brick or Concrete Walls to be Waterproofed

General: Sections 1 to 4 inclusive are to be carefully followed and

7. Application:

After the general conditions have been fulfilled, two thoroughly saturating coats of GF No. 100 Colorless Waterproofing (or as many more as may be necessary to thoroughly fill the surface) are to be applied to (mention the surfaces). Twenty-four hours is to be allowed to elapse between coats.

Specifications—Continued

Checking Efflorescence on Walls

General: Sections 1 to 3 and 5 to be carefully followed, and

8. Preparation of Surface:

Brush off, without the use of water, all powdery excrecence, salts, etc., from the face of the wall. When convinced that the wall and the pointing put in joints and crevices is thoroughly dry, apply a sufficient number of coats of GF No. 100 Colorless Waterproofing to completely close the pores of all weather exposed surfaces.

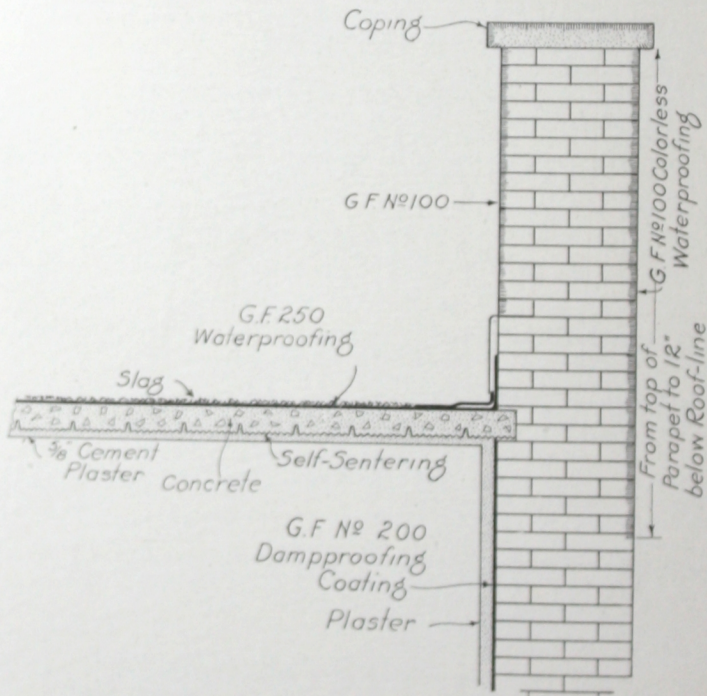
As another insurance against this trouble appearing again it is absolutely necessary to caulk around doors and windows with GF No. 250 Mastic Cement in accordance with specifications given on page 67.

Parapet Walls and Copping to be Waterproofed

General: Sections 1 to 4 inclusive to be carefully followed, and

9. Application:

After the general conditions have been fulfilled, apply to both sides of parapet walls not less than two coats of GF No. 100 Colorless Waterproofing, carrying this



Method of Waterproofing Parapet Walls. Showing also the use of GF No. 200 for Dampproofing and GF No. 250 for Roof Waterproofing

coating from the cap flashing up the back of the parapet over the coping stone and down the exterior side of the parapet wall to at least 6 inches below where the Damp-proofing or Furring on the interior face of the wall ceases.

Specifications—Continued

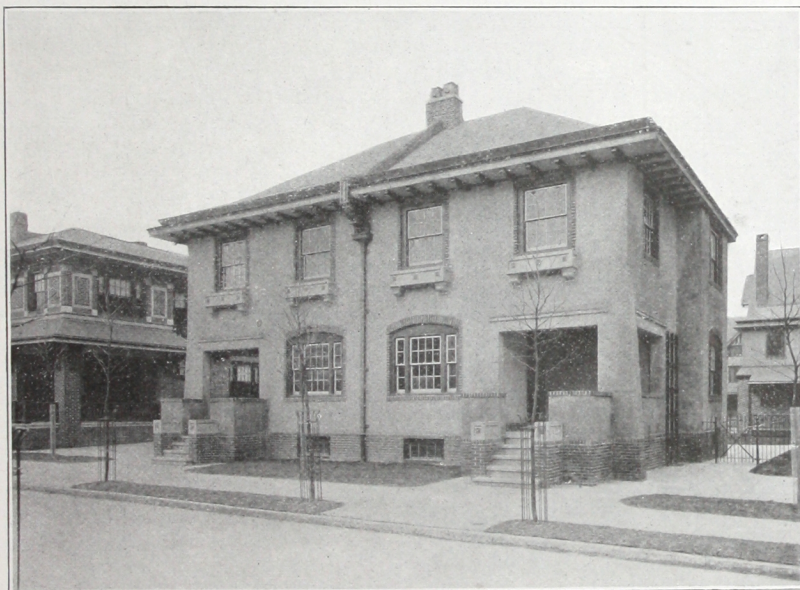
Interior Surfaces of Concrete or Brick Containers to be Waterproofed

General: Sections 1 to 4 inclusive are to be carefully followed, and

10. Application:

After the pointing is thoroughly dry, apply to the interior surface of the container to be waterproofed, two coats of cement wash of cement and water, made in the consistency of a thin cream. After this has cured, brush off all material that does not adhere strongly to the wall or floor, and apply not less than two coats of GF No. 100 Colorless Waterproofing, allowing the usual time of 24 hours to intervene between coatings.

(Note: This material should be allowed to set as long as possible before it is subjected to pressure of liquids on the inside of the tank, as it takes several days for it to reach its maximum strength.)



Typical Residence, Girard Estate, Philadelphia, Pa. GF No. 10 used in foundation walls and GF No. 100 on outside walls

GF No. 101 Brick and Cement Coating

The widespread development of stucco and cement exteriors for buildings of every character has created a demand for a coating which can be successfully used over such surfaces, not only to waterproof the walls, but to preserve their texture and equalize the uneven appearance due to variations in material and application; in many cases to add also a color or tint for artistic effect.

The use of ordinary paint with linseed oil cannot be made satisfactory over masonry surfaces. The oils will combine immediately with the alkalis in the cement, forming a soaponified compound, which is soluble in water, and continued rainstorms will eventually destroy this coating.

Efforts have been made to overcome these troubles by the use of various chemicals intended to change alkali into an inert material. But the varying density of each wall meant that a different solution was necessary for different parts of the surface. Where the solution was not exactly sufficient to neutralize the alkaline action, it weakened the bond of the cement, and chipping and scaling of the paint film and the cement was the result.

Other experiments have been made with solutions of various acid salts such as zinc alum, etc., but they also weakened the bonding power of the cement, and at the same time introduced moisture under the surface which must be allowed to thoroughly evaporate before any coating can be applied.

After careful consideration of these objections, GF No. 101 Brick and Cement Coating has been scientifically compounded. The pigments and vehicle are not affected in any way by the constituents of cement—they have, on the other hand, a decided affinity for them. This coating is both waterproof and decorative; can be applied to brick, tile and stone as well as cement, and penetrates the pores to an extent that it becomes an integral part of the surface without in any way destroying its texture. It overcomes any lack of uniformity in surface shading, and gives either a soft, flat finish or a glossy surface of the desired shade.

GF No. 101 Coating will adhere tenaciously, and sets hard enough to resist the action of the elements. Yet it retains the elasticity necessary to conform to expansion or contraction stresses in the wall itself.

Furnished from stock, either flat or gloss finish, as follows:

White	Portland Gray
Old Ivory	Concrete Gray
Buff	Tile Red
Bedford Gray	Brownstone

Covering Capacity

First coat.	100 to 150 sq. ft. per gallon
Second coat.	200 to 250 sq. ft. per gallon
Two coats.	80 to 100 sq. ft. per gallon

Preparation of GF No. 101 for Application

First: Cut out the entire top of the can to allow for stirring and mixing of the contents. The coating shall be stirred with a stiff paddle until the pigment is evenly and uniformly mixed with the liquid and the contents of the package of an even consistency.

Second: It is advisable to add a small proportion of turpentine in the first coat as an aid to penetration. No thinner shall be used for the second or any succeeding coat.

Third: If the coating becomes too heavy because of evaporation of the liquid, from continued exposure to the air, it shall be thinned to the original consistency with a small amount of pure spirits of turpentine.

Special care shall be taken to cover the package when not in use to avoid, as far as possible, evaporation and eliminate the necessity of thinning.

Specifications for Applying GF No. 101 Brick and Cement Coating

**Exterior Concrete, Brick or Other Masonry Surfaces to be
Dampproofed with Coating which Imparts a Color Finish**

General:

1. Material:

GF No. 101 Brick and Cement Coating as manufactured by The General Fireproofing Company, Youngstown, Ohio, must be purchased from the manufacturers direct or from their authorized Agents. The material must be delivered on the site in original sealed packages and applied according to the manufacturer's directions.

2. Stirring:

The GF No. 101 must be thoroughly stirred before using and during the application often enough to keep the pigments in suspension. Neglect of this precaution will result in an uneven coating which will greatly injure the appearance of the finished work.

3. Preparation of Surface:

The surface to receive this coating must be clean, dry and any particles of foreign matter must be removed by wire brushing or scraping before the coating is applied.

4. Preparation of Previously Painted Surfaces:

Where it is desired to coat a surface that has been previously painted, this surface must be thoroughly wire brushed so as to remove all loose particles of material adhering to the surface. Then two coats of GF No. 101 may be applied in the manner specified below.

5. Removing Old Paint:

Where it is desired to coat a surface that has been previously painted, and to remove this paint before the new coating is applied, the best method is to use a reliable paint and varnish remover with which to do this work.

6. Weather Conditions:

Owing to the nature of the material, weather conditions must be considered in treating a surface with GF No. 101. A temperature of from 60 to 80 degrees is most favorable to its application and the material must not be applied when the temperature is below 60 degrees. To get the best results, the material should not be applied when there is an excess of humidity in the atmosphere.

7. Application:

After the surfaces have been prepared, two coats of GF No. 101 of the desired color are to be applied in accordance with the conditions specified above. This material is to be put on with a short, stiff bristle paint brush, great care being taken that it is thoroughly brushed into the surface to insure the greatest possible penetration.

Two coats of GF No. 101 are necessary to an even colored job. The second coat is to be applied 24 to 48 hours after the application of the first coat and there is to be an interval of 24 to 48 hours between succeeding coats.

Tanks or Other Containers to be Waterproofed

General: Sections 1 to 7 are to be carefully followed, and

8. Curing:

The greatest possible amount of ventilation must be provided to cure the coating. The tank should not be filled with water or the GF No. 101 Coating subjected to any traffic or abuse for at least 3 days from the time of coating if the weather is reasonably dry and clear. In case of damp, muggy weather, a longer time should be allowed before any water is allowed to enter the container.

GF No. 250 Mastic Cement

There are a great many uses for waterproof cement such as pointing between copings or flashings and walls, for joints between vault lights, embedding hip rolls and ridgings, pointing up valleys where close fits are not possible, and around leaky chimneys—in fact, wherever joints or cracks in masonry must be protected against water penetration.

The same material can also be used in combination with oakum for waterproofing joints around door casings, window frames, skylights and dormers; and as a plastic coating easily applied, for concrete roof covering to save the expense of a built-up composition roofing.

In any case the cement should be pliable upon application and should set into a strong, watertight joint or coating, but one which will expand or contract readily with the material to which it is applied.

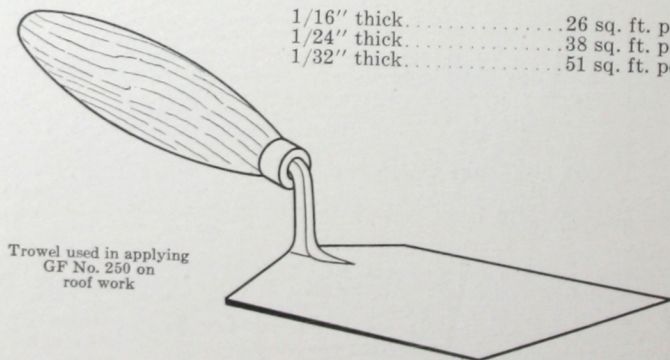
GF No. 250 is a plastic waterproof cement which can be easily trowelled onto a horizontal or vertical surface and sticks to it permanently, hardening into a firm, durable coating. It is so constituted that there is no danger of cracking even in zero weather nor of running under severe heat. This makes GF No. 250 particularly valuable as a filler for joints and as a covering for concrete roofs. The hair and knife cracks in concrete roof slabs are kept watertight by a coating of GF Mastic Cement.

It is applied with a trowel or with a 3" scraper. If a trowel is used, the material is smoothed down with the end of a flat plasterer's trowel. It can be used over shingles, tin, canvas, ready roofing, slate, tile or concrete, and adheres readily to all.

Because GF No. 250 never sets hard, it may catch enough dirt and dust to form a film over the surface. Where for appearance sake, this is undesirable, slag, pebbles, crushed brick, marble, granite or colored sand may be rolled into the finished surface to give an artistic treatment.

It is furnished in black, brown, red, gray, green and buff. On a reasonably smooth surface a gallon will cover approximately as follows:

1/16" thick.....	26 sq. ft. per gallon
1/24" thick.....	38 sq. ft. per gallon
1/32" thick.....	51 sq. ft. per gallon



Trowel used in applying
GF No. 250 on
roof work

Specifications for Applying GF No. 250 Mastic Cement

1. Material:

GF No. 250 Mastic Cement as manufactured by The General Fireproofing Company, Youngstown, Ohio, must be purchased direct from the manufacturers or their authorized Agents. This material must be delivered on the building site in original and sealed packages. It must be applied according to the manufacturer's directions, without addition or adulteration.

Waterproofing Brick, Concrete or Stucco Walls

2. Preparation of Surface:

The surface of the concrete, stucco or brick is to be thoroughly wire brushed so as to remove all loose particles, scale, mortar, etc. and leave the surface in a firm and solid condition. All large holes or cracks are to be pointed with cement mortar before any coating is applied.

3. Application:

A thorough coating of GF Mastic Cement is to be trowelled over the entire surface, great care being taken to see that the backs of any parapet walls are carefully covered. Great care must be taken that the coating is thoroughly trowelled in around all window frames to insure a tight joint around all lintels and sills. The coating thus applied should not be less than $\frac{1}{16}$ inch thick at any point.

Waterproofing the Backs of Parapet Walls

General: Sections 1 and 2 are to be carefully followed, and

4. Application:

A thorough coating of GF Mastic Cement is to be trowelled over the back of parapet walls, great care being taken to see that the joint between cap flashing and the first course of brick above is very carefully filled up. Where there is a concrete parapet, this Mastic Cement should be brought down well under the copper flashing so as to thoroughly fill this joint.

This coating should be carried up through and under the coping, whether it be of tile, limestone, or concrete.

Setting Cap Flashing

General: Section 1 to be carefully followed, and

5. Application:

Before the cap flashing is set into the brickwork, a coating of GF No. 250 Mastic Cement should be trowelled over the entire surface of the brick. After the cap flashing is set, another covering coat should be trowelled over the top of the flashing so as to give a thoroughly filled joint before the cement mortar is applied for setting the upper course of brick.

Pointing up Around Window Frames

General: Section 1 is to be carefully followed, and

6. Application:

Remove the hanging stile from the outside frame of window casing and caulk plumbers' oakum into the opening, filling the space to within $\frac{1}{4}$ inch of the surface. After the joint has been practically filled with oakum in this manner, GF No. 250 should be trowelled in so as to fill the joint flush with the surface. Care is to be taken to see that this material is forced into the opening so as to thoroughly fill it and leave no cracks or openings at either side. Considerable pressure is to be used so as to insure a bond of the material to the wood on the one side and the cement, tile or brick on the other.

Specifications—Continued

Waterproofing Concrete Roofs

General: Sections 1, 2 and 3 are to be carefully followed, and

7. Application:

A thorough coating of GF No. 250 Mastic Cement is to be trowelled over the entire surface of the roof not less than $\frac{1}{8}$ inch thick. Great care is to be taken to see that this coating is brought well up under the flashing and also over it in order to insure a tight joint at this point.

8. Gravel or Slag Coating:

Either regular roofing slag or small roofing gravel may be rolled into the surface of this coating for protection and texture effect. Not less than 20 pounds of slag or 250 pounds of gravel per 100 square feet is to be used. The gravel or slag, whichever is used, must be perfectly dry. If necessary, heat it to obtain this result.

GF No. 140 Concrete Hardener

Concrete floors or walks, no matter how carefully laid, will almost invariably dust up heavily when subjected to wear unless some special precaution is taken. This not only results in rapid deterioration of the floor or sidewalk, but causes a great deal of damage from the dust which rises into the atmosphere.

Such dust works its way into the most carefully guarded bearings of machinery, causing great damage, and has recently been found to be particularly harmful to textiles of all kinds.

The most permanent method of preventing this condition, and the most economical, is to incorporate a hardening element into the surface of the finished floor, using GF No. 140 Concrete Hardener. This is a finely graded mineral powder combined with an oxidizing agent which when brought in contact with the wet surface of the concrete floor, bonds thoroughly with the lime and silica to form a dense, hard coating.

The use of GF No. 140 does not in any way alter the method of laying the floor, for it is simply dusted on evenly after the concrete and cement have been laid. The result is a firm, wear-resisting and dust-proof floor.

Put up in 100-pound paper lined cloth sacks.

Specifications for Applying GF No. 140 Concrete Hardener

1. Material:

GF No. 140 Concrete Hardener is to be that manufactured by The General Fireproofing Company, Youngstown, Ohio, and is to be purchased direct from them or their authorized Agents. The Hardener must be delivered at the building site in original and sealed packages, and must be used absolutely in accordance with the manufacturer's directions.

2. Cement:

All cement to be a high grade Portland Cement, meeting satisfactorily the requirements of the standard specifications of the American Society for Testing Materials, and shall preferably be so ground that (80%) will pass a standard (200) mesh sieve.

3. Sand:

All sand shall be absolutely free from loam, clay, vegetable or other deleterious organic matter, and uniformly graded from coarse to fine in size.

4. Grit:

If it is desirable to use grit this material is to be crushed traprock, granite, or white quartz grit, that will pass a $\frac{3}{16}$ -inch screen.

5. Mixing:

Mix the cement, sand and grit thoroughly together in the manner usually employed when laying an ordinary concrete floor, turning it over at least three times dry. Then add sufficient water to temper the mass to the desired consistency.

6. Drying Coat:

For every 100 square feet of surface, take 15 pounds of GF No. 140 and 15 pounds of Portland Cement and mix same thoroughly together dry.

(Note: Where floors are to be subjected to excessively hard wear, write The General Fireproofing Company conditions to which the floors are to be subjected, and they will send you a special specification for the particular type of floor. The proportion given is for floors which are to withstand ordinary wearing conditions.)

7. Method of Laying:

Spread the top finish to the desired thickness ($\frac{3}{4}$ inch or 1 inch) ruling it off with a straightedge to a smooth and even surface. Work this top finish very thoroughly with a float to remove all bubbles. As soon as the water rises to the surface, spread the mixture of cement and GF No. 140 Concrete Hardener, all ready prepared, as a drying coat over the entire space, using a fine screen (or sieve) and taking great care to leave no bare spots.

8. Finishing:

When the floor is ready for finishing, work the surface thoroughly with a wooden float. Tamp the surface down well with the float and rub the floor hardener mixture into it thoroughly. Then finish in the usual manner with a steel trowel.

9. Curing:

Twenty-four hours after the floor is finished, it should be wet down and kept wet for a period of six days, either by flushing with water two or three times a day, or the surface may be covered by a layer of sawdust, paper or sand and kept wet. The floor should then only be used for light traffic for a period of 30 days, or until the skin coat of cement, brought to the surface by the action of trowelling, is worn away.

GF No. 145 Crystalrox

Where concrete or cement floors have been laid for some time, the problem of hardening and dustproofing the surface is more serious than on new work. It requires a compound which will penetrate the surface pores and permanently harden the top layer of the floor.

The same action should form a protection from water and acids in solution, and when applied to the surface of limestone or marble walls, should render them impervious to water and staining. Most of these discolorations are due to a combination of moisture which has penetrated the stone with the salts and alkali in the backing wall mortar. The method of coating the exterior surface is most economical and effective, and at the same time easiest to apply.

GF No. 145 Crystalrox, when dissolved in water and applied to the surface of a concrete floor—using two coats—will increase its resistance to wear about one-third. At the same time it forms an effective protection against the attack of dilute acids, either organic or mineral.

The use of GF No. 145 on marble and limestone forms a hard film which is impervious to water and acid gases and strongly resists abrasion.

Crystalrox is put up in dry crystalline form. Two pounds to a gallon of water makes the proper solution. This amount covers from 175 to 200 square feet with two coats, keeping the cost for both walls and floors lower than any other method that will give equally good results.

Specifications for Applying GF No. 145 Crystalrox

General:

1. Material:

GF No. 145 Crystalrox is to be purchased direct from the manufacturers, The General Fireproofing Company, Youngstown, Ohio, or their authorized Agents. These materials are to be brought to the building site in original and sealed packages, and applied in accordance with the manufacturer's specifications and directions.

2. Preparation of Surface:

All surfaces to be treated are to be clean and free from dust or any other foreign matter.

3. Preparation of Material:

Dissolve 2 pounds of GF No. 145 Crystalrox in 1 gallon of water. Care must be taken that the crystals are thoroughly dissolved before the solution is used for coating.

4. Application:

The solution of GF No. 145 in water is to be applied to (mention whether to floors, for dustproofing or to exterior or interior limestone or marble) as a thorough saturating coat. This solution may be applied with a brush, sponge or mop, so as to insure the entire saturation of the surface.

If all the solution does not penetrate into the concrete or stone after five or ten minutes remove the surplus with a sponge.

5. Caution:

Great care should be exercised to see that surfaces are dry after each application and that all the material has been absorbed. Any material left on the surface will

Specifications—Continued

crystalize and, because it does not come in contact with the lime, would in no way be affected and therefore is of no use as a protection.

Solutions of GF Crystalrox should be kept in earthenware and no metal of any kind is to come in contact with the material.

Workmen who are applying this material must be careful not to let it come in contact with their eyes or cuts or bruises on their hands, as its action is very corrosive.

Specifications for Applying GF No. 145 Crystalrox as a Floor Dustproofing

General: Sections 1, 3, 4 and 5 are to be carefully followed, and

6. Repairing Surfaces:

The floors are to be carefully cleaned of grease, mortar stains, and all particles of foreign matter. They are to be washed with clean water, so as to remove all dust before the coating is applied.

GF No. 400 Bonding Compound

(For Bonding New Concrete to Old)

The problem of bonding new concrete to old occurs both in repairing or adding to old concrete, and on new construction where each day's work must be joined to the next. In applying waterproofed cement mortar, also, perfect adhesion is indispensable to effective work and depends upon the solidity of the bond.

The old surface is prepared for bonding by such mechanical means as scouring, hacking and wire-brushing, but these methods are insufficient alone for they do not always expose the aggregate. The real obstacle to a perfect joint, in any case, is a thin, glassy cement film which forms on the surface of concrete and sets with particles of dust and dirt firmly imbedded in it. To secure a dependable bond this hard film and all foreign substances must be removed from the old surface so that the aggregates are exposed for active union with the new concrete.

GF No. 400 is put up in the form of a powerful acid powder to be dissolved in water and applied to the surface of the concrete. It effervesces immediately, removing this film and all foreign material and exposing the aggregate of the concrete ready for joining with the new material.

In preparing GF No. 400 every precaution has been taken to prevent injuring the strength or durability of the concrete, to which it is applied. In fact, tests show that concrete bonded together in this way and tested to destruction, breaks more quickly at any other point than at the point of joining.

GF No. 400 is put up in five pound jars and packed 12 jars to the case. Two pounds dissolved in one gallon of water will treat from 100 to 150 square feet of concrete, varying according to the porosity of the surface.

Specifications for Use of GF No. 400 Bonding Compound

1. Material:

The Bonding Compound used for all work shall be GF No. 400, manufactured by The General Fireproofing Company, Youngstown, Ohio, and shall be purchased direct from them or their authorized Agents. It shall be brought to the building site in original and sealed packages and applied according to the manufacturer's directions.

2. Preparing Surfaces:

Surfaces to be treated with the Bonding Compound shall first be rubbed thoroughly with a mason's chipping hammer, then cleaned with a wire brush to remove all loose particles.

3. Mixing Material:

In each gallon of water to be used in washing the surface, dissolve 2 pounds of GF No. 400 Bonding Compound. After this has been stirred well, and gone thoroughly into solution, it may be used.

4. Application:

Apply a liberal coat of GF No. 400 in solution to the rough surface, using either a broom or an acid brush. Permit this to remain until all effervescence and chemical action have ceased.

If the first application does not completely clean the surface and expose all aggregates, apply a second coating in the same manner.

5. Washing:

Directly after GF No. 400 has exhausted itself (after chemical action has stopped) wash down the surface by several applications of clear clean water, and if the surface is thoroughly saturated by this means to a point where it will absorb no more water, apply a thin cream of cement and water. Before this cream of cement and water sets, and becomes hard, join on the new concrete.

(Note: If a hose is available for washing down the wall, this affords the best means of cleaning it readily, and also saturating it thoroughly.)

GF No. 99 Acidproofing

A great many uses and conditions nowadays demand the application of acidproof coatings. Tanks, containers and vats have to be protected against acids and alkali solution; the concrete or cement floors of dairies must be protected from the disintegrating effect of lactic acid; walls and steel work in industrial plants require a protective coating against acid gases in the atmosphere. And in surgical wards, in fact on any hospital walls, an acidproofing coat is necessary.

The problem is to get a coating strong enough to neutralize these outside influences and, at the same time so neutral in itself that it will not destroy the surface to which it is applied. In many cases the acidproofing compound combines with the floor or wall to destroy its own effectiveness.

GF No. 99 Acidproofing is a colorless coating, which when applied to a cement, plaster or wood surface, closes it completely against the action of dilute acids or alkali solutions or gases. It is chemically neutral forming a durable film on the surface to which it adheres, but does not react with it in any way. GF Acidproofing can be applied to either plain or colored walls and floors, rendering the surface impervious to acid and other destructive agencies without altering its appearance.

After applying GF No. 99 Acidproofing, it is necessary for the tank or surface to cure or dry for 4 days before using.

Covering Capacity

First coat.....	350 sq. ft. per gallon
Two coats.....	Approximately 200 sq. ft. per gallon

Specifications for Applying GF No. 99 Acidproofing

1. Material:

GF No. 99 Acidproofing, as manufactured by The General Fireproofing Company, Youngstown, Ohio, is to be purchased direct from the manufacturers or their authorized Agents, and is to be delivered on the building site in the original sealed packages. It must be applied as received, without addition or adulteration of any kind, except as directed.

2. Preparation of Surface:

Before the GF No. 99 is applied, all surfaces should be carefully pointed and wire brushed so as to remove any loose particles and foreign matter.

If there is any grease or dirt present, the surface should be scrubbed with benzine so as to remove this matter and leave the surface in a perfectly clean condition.

3. Application:

After the surface has been cleaned of all foreign matter and is absolutely dry, apply not less than 2 coats of GF No. 99, brushing this material in thoroughly so as to insure the covering of the entire surface and the penetration of the material as far as possible.

The more vigorous the use of the brush, the better will be the results obtained from this coating.

4. Treating Floors:

If the floor surface is very dense and hard, the first coat is to be 50% pure spirits of turpentine and 50% GF No. 99; the second coat is to be 25% pure spirits of turpentine, 75% GF No. 99; and the third coat, straight GF No. 99.

Specifications—Continued

(Note: Unless the floor is very dense in surface or texture, the spirits of turpentine is to be omitted from the second coating.)

5. Tinted Walls—Protecting:

After (name walls) are coated with GF No. 101, and that coating has cured 24 hours, apply a thorough coating of GF No. 99, following Sections 1 and 3 carefully.

6. Curing:

In every case, coatings of GF No. 99 Acidproofing must be allowed to cure or set at least 4 days before subjected to any test or, in the case of a floor, any severe traffic.

GF No. 150 Floor Primer and GF No. 151 Floor Coating

Wherever a cement or concrete floor is to be given a particular finishing color, it is necessary to prime the surface thoroughly to insure uniform color value throughout. Variations are due to irregularities in density which can be remedied only by killing the suction of the cement with a primer which thoroughly fills all the pores.

A coat of No. 150 Floor Primer leaves the entire surface of an even density by filling the surface pores. This forms the proper base for the coloring coat (GF No. 151) or where no particular color effect is required, a second coating of GF No. 150 makes a satisfactory floor finish which is waterproof and can be easily cleaned.

GF No. 151 Floor Coating, applied after priming with GF No. 150, imparts a uniform, dense color to the entire surface. It also protects the floor from oil, grease and water and renders it non-abrasive and non-dusting even under severe wear. Cleaning and scrubbing do not affect the color at all.

The combination of GF No. 150 and No. 151 is economical from the side of material cost, for where a priming coat is applied less of the finishing color coating is required. For example: If two coats of GF No. 151 are ordinarily necessary for a satisfactory job, the substitution of GF No. 150 for the first coat will give exactly as good results.

GF No. 151 is furnished in eight colors. Color chart showing the various shades furnished on request.

Covering Capacity

First coat (GF No. 150 Floor Primer).....	150 sq. ft. per gallon
First Coat (GF No. 151 Floor Coating).....	300 sq. ft. per gallon
First Coat (GF No. 151 Floor Coating).....	200 sq. ft. per gallon
Second coat.....	300 sq. ft. per gallon

Preparation of GF No. 150 and GF No. 151 for Application

First: Cut out the entire top of the can to allow for stirring and mixing of the contents. The coating shall be stirred with a stiff paddle until the pigment is evenly and uniformly mixed with the liquid and the contents of the package of an even consistency.

Second: It is advisable to add a small proportion of turpentine in the first coat as an aid to penetration. No thinner shall be used for the second or any succeeding coat.

Third: If the coating becomes too heavy because of evaporation of the liquid, from continued exposure to the air, it shall be thinned to the original consistency with a small amount of pure spirits of turpentine.

Special care shall be taken to cover the package when not in use to avoid, as far as possible, evaporation and eliminate the necessity of thinning.

Specifications for Applying GF No. 150 Floor Primer and GF No. 151 Floor Coating

1. Material:

The Floor Primer is to be GF No. 150, and the Floor Coating GF No. 151 as manufactured by The General Fireproofing Company, of Youngstown, Ohio, and is to be purchased direct from them or their authorized Agents. The material shall be brought to the building site in original and sealed packages and applied without addition or adulteration except as stated in The General Fireproofing Company's specifications.

2. Preparation of Floors:

The floors shall be scrubbed clean so as to remove all dust, dirt and loose particles. The surface shall be cleaned of all grease or any other foreign matter.

If the floor has been coated with any other paint coating, this shall be removed with paint and varnish remover. If necessary, wire brushes shall be used to clean the surface of scales or mortar or paint.

Floors to be coated shall be absolutely dry before any attempt is made to apply the paint.

3. Application:

The Floor Primer shall be carefully brushed into all surfaces, using a stiff bristle brush. In no case shall a gallon of GF No. 150 be allowed to cover more than 150 square feet.

After the Primer has been allowed to cure at least 24 hours, one or more coats of GF No. 151 Floor Coating shall be applied as specified, care being taken that the coating is thoroughly and evenly brushed out, leaving a uniform continuous color surface.

At least 24 hours, and if any way possible, 48 hours shall be allowed between coats. The floor shall not be walked upon for at least 48 hours after the last coat is applied. To insure this, all doors leading to floors coated shall be locked so that no one may intrude.

The floor shall not be subjected to severe traffic for at least a week after the final coat has been put on.



ST. ELIZABETH'S HOSPITAL, Youngstown, Ohio—Architect, Chas. Owsley, Youngstown, Ohio. Contractor, Heller Bros., Youngstown, Ohio. Floors throughout painted with GF No. 150 Floor Primer and GF No. 151 Floor Coating



BRETTON HALL APARTMENTS, Columbus, Ohio—Stairs and Landings painted with GF No. 150 Floor Primer and GF No. 151 Floor Coating

GF No. 499 Wall Size and GF No. 500 Interior Wall Coating

In the preparation of Interior Wall Coatings two essentials for such materials should govern their manufacture—first, sanitation; second, decorative effect.

The first consideration—sanitation—is in accord with a widespread agitation against wall paper and similar coverings, particularly for public buildings. Consequently the ingredients used in GF No. 500 Wall Coating have been selected with particular reference to their purity, and their immunity from any element which might propagate or foster germ life. As a result, GF No. 500 typifies the most wholesome form of wall coating, and one which can be readily cleaned with a damp cloth, or washed with soap and water without in any way destroying its fine appearance.

From the decorative standpoint, soft, rich tones are most desirable. These effects are obtained by varying the proportions of the different materials and they have been carefully worked out in GF No. 500 Wall Coating. It can be used with equally good results on wood, plaster, cement, stucco or metal, imparting a dense, clear color of uniform value throughout.

Before applying GF No. 500, a sizing or priming coat of GF No. 499 Wall Size should be applied. This effectively kills the suction of a plaster wall, insuring an even, non-porous base for the coloring coat.

Colors are furnished from stock as follows: White, Light Yellow, Light Sage, Old Ivory, Colonial Yellow, Pea Green, Buff, French Ochre, French Gray, Light Delft Blue, Dark Delft Blue, Scarlet Lake.

Covering Capacity

First coat.....	350 sq. ft. per gallon
Second coat.....	400 sq. ft. per gallon
Two coats.....	Approximately 185 sq. ft. per gallon

Preparation of GF No. 499 and GF No. 500 for Application

First: Cut out the entire top of the can to allow for stirring and mixing of the contents. The coating shall be stirred with a stiff paddle until the pigment is evenly and uniformly mixed with the liquid and the contents of the package of an even consistency.

Second: It is advisable to add a small proportion of turpentine in the first coat as an aid to penetration. No thinner shall be used for the second or any succeeding coat.

Third: If the coating becomes too heavy because of evaporation of the liquid, from continued exposure to the air, it shall be thinned to the original consistency with a small amount of pure spirits of turpentine.

Special care shall be taken to cover the package when not in use to avoid, as far as possible, evaporation and eliminate the necessity of thinning.

Specifications for Applying GF No. 499 Wall Size and GF No. 500 Interior Wall Coating

1. Material:

GF No. 499 Wall Size and GF No. 500 Interior Wall Coating, as manufactured by The General Fireproofing Company, Youngstown, Ohio, must be purchased direct from the manufacturers or their authorized Agents. This material must be delivered on the building site in the original and sealed packages, and must be applied according to the manufacturer's directions.

2. Condition of Wall:

All walls to be coated shall be permitted sufficient time to become perfectly hard and absolutely dry before the application of any coating.

All cracks and depressions shall be filled with Plaster of Paris paste, which shall be allowed to become perfectly hard and dry.

3. Preparation of GF No. 500:

First, pour the excess of thin liquid on top of the pigment, into a separate can. After thoroughly stirring the heavy material in the bottom of the can, return the original vehicle, at the same time stirring constantly so as to insure the most perfect mixing of the pigments and vehicle.

Second: If the material is exposed to the air so long as to become thick and heavy due to evaporation of the volatile material, it shall be thinned with the smallest possible amount of pure Spirits of Turpentine to restore it to the original consistency.

4. Method of Application:

New Walls: All new walls, either smooth or sand finished, which are perfectly dry and have been protected so as to obviate danger of future absorption of moisture or dampness, shall be given an even, thorough coating of GF No. 499 Wall Size, to which shall be added GF No. 500, of the color to be used in finishing the wall, in the proportion of one part GF No. 500 to three parts GF No. 499. This coating of GF No. 499 shall be allowed to cure or dry at least 24 hours before additional coats of GF No. 500 are applied.

5. Old Walls: Old walls which have been painted with kalsomine or cold water paint must be thoroughly washed so as to remove all the old material. If such walls have been sized with a glue sizing, this must also be removed and the wall treated as specified above.

If the wall has been previously treated with a varnish sizing, it will not be necessary to apply a coat of GF No. 499.

After the GF No. 499 has dried for at least 24 hours, apply the first coat of GF No. 500. It should be flowed on with the best quality of wall brush and smoothed out lightly to give a uniform, even coating.

After the first coat has cured or dried for at least 24 hours, apply the second coat just as it comes from the can, being sure to stir it thoroughly before the work is started and frequently thereafter to keep the pigments in perfect suspension.

GF No. 300 Shop Coating

In the composition of a shop coating for steel there are several strongly disintegrating influences which must be overcome.

The first of these is the action of the alkali in cement which comes in contact with the shop coating. It must be specially compounded to retain its waterproofing value, for where cement reaches ordinary oil paints, it soon destroys the oil, leaving only a cracked and ineffective pigment adhering to the metal.

The second influence is that of electrolysis, caused by stray electric currents finding their way to the steel through cracks in the coating, which rapidly collect moisture. Unless the film remains intact over the whole surface, expanding and contracting with the steel without cracking, it cannot be considered a dependable coating.

GF No. 300 Shop Coating is designed as a priming coat for structural steel. When brushed thoroughly over the entire surface it forms a tough, adhesive film impervious to water, acids and alkali, and insulating the steel against electricity.

Its co-efficient of expansion has been made exactly the same as that for steel, eliminating any danger of cracking or scaling off upon the expansion and contraction which naturally takes place.

In the composition of GF No. 300 the constituents were selected also to insure adhesion, and to be strongly rust preventative. The coating while intended as a primer can be used for the finish or decorative coat on steel exposed to the atmosphere. It forms a heavy, lustrous and weatherproof coating.

Made in five colors as follows: Black, Gray, Green, Red and Brown.

Covering Capacity

First coat.....	200 sq. ft. per gallon
Second coat.....	200 sq. ft. per gallon
Two coats.....	100 sq. ft. per gallon

Specifications for Applying GF No. 300 Steel Coating

Material:

Material designated as Shop Coating for Steel is to be GF No. 300 Shop Coating for Steel as manufactured by The General Fireproofing Company, Youngstown, Ohio, and is to be purchased direct from them or their authorized Agents. The material is to be brought on the work in the original and sealed packages and applied without addition or adulteration.

Cleaning the Steel:

All steel before coating shall be carefully wiped to remove all moisture and oil and then wire brushed to remove all loose scale.

Application:

Apply a coating of GF No. 300, working the compound into all the joints and crevices before riveting the parts together. Another coat is to be applied after the steel sides are riveted and before removal from the shop. The removal from the shop is to take place not less than 48 hours after the final coating of GF No. 300 is applied.

Specifications—Continued

Field Coating:

After erection, all foreign matter that may have attached itself to the steel during transportation and the time it was laying on the job is to be carefully removed, either by wiping or other means.

After the steel has been cleaned as above specified, all abraded surfaces are to be retouched with GF No. 300.

Then the steel shall receive one heavy coat of GF No. 325 Field Coating for Steel.

GF No. 325 Protective Coating

(For Structural Steel to be Embedded in Masonry)

When structural steel is to be encased in concrete or other masonry, the final protective coating can be a less expensive material than the shop coat generally applied. If it covers the steel thoroughly, adheres to it in a strong water and alkali-proof film and will expand or contract without cracking, the protection will be satisfactory.

GF No. 325 is manufactured as a final Protective Coating to be used over a shop coat such as GF No. 300. Its constituent parts are fused together at great heat to prevent disintegration by the lime in cement or cement grout and to keep the coating permanently elastic.

The resulting protective film is tough, impervious to water and the alkalis present in green masonry and can be depended upon to expand and contract with the steel without cracking. It is also a sufficient insulator to prevent any disintegration by electrolysis.

Covering Capacity

First coat.....	200 sq. ft. per gallon
Second coat.....	200 sq. ft. per gallon
Two coats.....	Approximately 100 sq. ft. per gallon

Specifications for Applying GF No. 325 Protective Coating

1. Material:

GF No. 325, manufactured by The General Fireproofing Company, Youngstown, Ohio, must be purchased from the manufacturers direct or from their authorized Agents and must be delivered on the building site in original and sealed packages. Apply without adulteration or addition according to the following instructions:

2. Application:

Immediately after erection the steel is to be closely examined to ascertain whether the shop coating has suffered any damage in transportation or erection. If such is the case re-coat such portions as have been damaged, with GF No. 300. After allowing this supplementary coating to become thoroughly dry apply the finishing coat of GF No. 325 Protective Coating for Steel, brushing same evenly and thoroughly so that the surface will be smooth and continuous.

3. Caution:

Before the different parts are placed they should be carefully inspected to see that they are all thoroughly covered with coating.

GF No. 350 Galvanized Iron Coating

The wide use of galvanized metals in building has created a demand for a paint or coating which can be used successfully on such materials. The chief difficulty in the past has been the lack of proper adhesion, most paints scaling off after a short time. This is due to a grease-like film formed during the galvanizing process. A coating which does not penetrate this film will soon scale off, while one which destroys the film is injurious to the metal itself.

In compounding GF No. 350 the aim has been to overcome this difficulty by combining a strongly adhesive element with one which would penetrate the film without destroying it. This gives the GF coating a firm grip on the iron, zinc or tin and prevents scaling. At the same time there is enough elasticity in GF No. 350 to keep it from cracking upon expansion or contraction of the surface to which it is applied.

This coating dries quickly, and sets hard, forming a strong rust inhibiting covering with exceptional wearing qualities and of an even color throughout.

GF No. 350 Galvanized Iron Coating is used for painting galvanized iron, tin or zinc materials, such as gutters and leaders, roofing and siding, etc. As a special precaution it is good practice to paint the under side of roofing and siding thoroughly with GF No. 350 before putting them in place.

This is a point often neglected in building which causes a great deal of trouble in later years, for moisture collecting on the under side quickly rusts the unprotected metal. The increased cost is not heavy, as the parts may be coated on the ground before being put in place.

The coloring pigment in GF No. 350 is mixed to form a smooth coating which is easily and evenly applied. Colors are carried as follows: Black, Red, Brown, Gray, Green; Flat and Gloss.

Covering Capacity

First coat.....	250 sq. ft. per gallon
Second coat.....	250 sq. ft. per gallon
Two coats.....	125 sq. ft. per gallon

Specifications for GF No. 350 Galvanized Iron Coating

1. Material:

The material designated as Galvanized Iron Coating shall be GF No. 350 Galvanized Iron Coating as manufactured by The General Fireproofing Company, Youngstown, Ohio, and is to be purchased direct from them or their authorized Agents. It must be brought to the building site in original sealed packages and applied without addition or adulteration.

2. Preparing Surfaces:

Before any coating is applied the surface of the metal shall be cleaned of all particles of foreign matter, such as mortar, plaster, other kinds of paint, etc., and shall be absolutely dry.

3. Application:

After the foregoing conditions have been complied with a thorough covering coat of GF No. 350 (of the desired color) is to be applied with great care. The coating must be thoroughly worked into all seams and joints and around all rivet heads that may be encountered.

When the first coat has cured for 24 hours, a second coat (this coat to be of the final color of the surface) shall be applied in the same careful manner.

4. Back Coating:

Before erecting, all sheets for roofing, siding, etc., shall be thoroughly coated on the back or unexposed face with 2 coats of GF No. 350 applied in accordance with Section 3.

Table No. 13

Volume of Plastic Mortar Made from Different Proportions of Cement and Sand
Quantities of Materials Per Cubic Yard

(Reprinted by permission from Taylor & Thompson's "Concrete, Plain and Reinforced," page 230)

Relative proportions by volume*		Volume of Compacted Plastic Mortar								Materials for 1 cu. yd. Compact Plastic Mortar Based on Barrel of					
		From 1 cu. ft. Cemt.				From 1 bbl. Cement				3 5 cu. ft.		3.8 cu. ft.†		4 cu. ft.	
		Based on Port. Cemt. weighing				Based on barrel of				Packed Cement	Loose Sand	Packed Cement	Loose Sand	Packed Cement	Loose Sand
		108 Lbs. per Cu. Ft.	100 Lbs. per Cu. Ft.	95 Lbs. per Cu. Ft.	90 Lbs. per Cu. Ft.	3 5 Cu. Ft.	3 5 Cu. Ft.	3 5 Cu. Ft.	3 5 Cu. Ft.						
Cement	Sand	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	bbl.	cu. yd.	bbl.	cu. yd.	bbl.	cu. yd.
1	0	0.93	0.86	0.80	3.2	3.2	3.2	3.2	3.2	8.31		8.31		8.31	
1	1	1.12	1.06	1.02	3.9	4.0	4.1	4.1	4.1	6.92	0.46	6.73	0.47	6.61	0.49
1	1 1/2	1.48	1.42	1.38	5.2	5.4	5.5	5.5	5.5	5.22	0.68	5.01	0.71	4.88	0.72
1	1 1/2	1.84	1.78	1.74	6.4	6.7	7.0	7.0	7.0	4.20	0.81	4.00	0.84	3.87	0.86
1	2	2.20	2.14	2.11	7.7	8.1	8.4	8.4	8.4	3.51	0.91	3.32	0.93	3.21	0.95
1	2 1/2	2.56	2.50	2.47	9.0	9.5	9.9	9.9	9.9	3.01	0.98	2.84	1.00	2.74	1.01
1	3	2.92	2.86	2.83	10.2	10.9	11.3	11.3	11.3	2.64	1.03	2.48	1.05	2.39	1.06
1	3 1/2	3.28	3.23	3.19	11.5	12.2	12.8	12.8	12.8	2.35	1.06	2.20	1.08	2.12	1.10
1	4	3.64	3.59	3.55	12.8	13.6	14.2	14.2	14.2	2.12	1.10	1.98	1.11	1.90	1.13

Note — Variations in the fineness of the sand and the cement, and in consistency of the mortar may affect the values by 10% in either direction.

*Cement as packed by manufacturer, sand loose.

†Use these columns ordinarily.

One cubic yard cement plaster covers:

5/8" thick—63 sq. yds. 3/4" thick—45 sq. yds. 1 1/4" thick—31 1/2 sq. yds. 1 3/4" thick—22 1/2 sq. yds.

3/4" thick—54 sq. yds. 1" thick—36 sq. yds. 1 1/2" thick—27 sq. yds. 2" thick—18 sq. yds.

10% lime added will increase these quantities not more than 5%.

Table No. 14

Cubic Yards Concrete Required for Beams, Columns and Slabs

Cubic Yards of Concrete for Beams
100 ft. Long

											COLUMNS			SLABS		
											Square		Round			
											Side of Square or Diam. of Round	Cubic Yds. per Ft. Height	Weights per Ft. Height and Area Section	Cubic Yds. per Ft. Height	Weight per Ft. Height and Area Section	
Width	4 Inch	5 Inch	6 Inch	7 Inch	8 Inch	9 Inch	10 Inch	11 Inch	12 Inch							
4"	.412															
5"	.515	.643														
6"	.617	.772	.926													
7"	.720	.900	1.080	1.260												
8"	.823	1.029	1.235	1.440	1.646											
9"	.926	1.157	1.389	1.620	1.852	2.083										
10"	1.029	1.286	1.543	1.801	2.058	2.315	2.572									
11"	1.132	1.415	1.697	1.981	2.263	2.546	2.829	3.112								
12"	1.235	1.543	1.852	2.161	2.469	2.778	3.086	3.395								
13"	1.337	1.672	2.006	2.340	2.675	3.009	3.343	3.677	3.704	4.012	.043	169	.034	132	7	
14"	1.440	1.801	2.161	2.521	2.881	3.241	3.601	3.961	4.321	4.681	.050	196	.040	153	9	
15"	1.543	1.929	2.315	2.701	3.086	3.472	3.858	4.244	4.630	5.015	.058	225	.045	176	7	
16"	1.646	2.058	2.468	2.881	3.292	3.704	4.115	4.526	4.936	5.347	.066	256	.052	201	1	
17"	1.749	2.186	2.624	3.061	3.498	3.935	4.373	4.810	5.247	5.684	.074	289	.058	227	0	
18"	1.852	2.315	2.778	3.241	3.704	4.167	4.630	5.093	5.555	6.018	.083	324	.065	254	5	
19"	1.955	2.443	2.932	3.421	3.909	4.398	4.887	5.376	5.864	6.353	.093	361	.073	283	5	
20"	2.058	2.572	3.086	3.601	4.115	4.630	5.144	5.658	6.173	6.687	.103	400	.081	314	2	
21"	2.161	2.701	3.240	3.781	4.321	4.861	5.402	5.941	6.482	7.023	.113	441	.089	346	4	
22"	2.263	2.829	3.394	3.961	4.526	5.093	5.659	6.224	6.790	7.356	.124	484	.098	380	1	
23"	2.366	2.958	3.549	4.141	4.732	5.324	5.916	6.507	7.099	7.691	.134	529	.107	415	5	
24"	2.469	3.086	3.704	4.321	4.938	5.555	6.173	6.790	7.408	8.026	.144	576	.116	452	4	
25"	2.572	3.215	3.858	4.501	5.143	5.786	6.429	7.072	7.716	8.359	.160	625	.126	490	9	
26"	2.674	3.343	4.012	4.680	5.349	6.018	6.687	7.356	8.023	8.691	.174	676	.136	530	9	
27"	2.778	3.472	4.167	4.861	5.556	6.249	6.944	7.638	8.333	9.027	.187	729	.147	572	6	
28"	2.881	3.601	4.321	5.041	5.761	6.481	7.202	7.922	8.642	9.362	.201	784	.158	615	8	
29"	2.984	3.729	4.475	5.221	5.967	6.713	7.459	8.205	8.951	9.697	.216	841	.170	660	5	
30"	3.086	3.858	4.630	5.401	6.173	6.944	7.716	8.488	9.259	10.030	.231	900	.182	706	9	
31"	3.189	3.987	4.784	5.581	6.379	7.176	7.974	8.770	9.568	10.366	.247	961	.194	754	8	
32"	3.292	4.115	4.938	5.761	6.584	7.407	8.230	9.053	9.876	10.699	.263	1024	.207	804	2	
33"	3.395	4.244	5.091	5.941	6.790	7.639	8.487	9.336	10.18	11.03	.280	1089	.220	855	3	
34"	3.498	4.372	5.248	6.122	6.996	7.870	8.745	9.619	10.49	11.37	.292	1156	.233	907	9	
35"	3.601	4.501	5.401	6.301	7.201	8.101	9.002	9.902	10.80	11.70	.315	1225	.247	962	1	
36"	3.704	4.630	5.555	6.481	7.407	8.333	9.259	10.19	11.11	12.03	.333	1296	.262	1017	9	

Table No. 16

Quantities of Materials for One Cubic Yard of Rrammed Concrete
Based on a Barrel of 3.8 Cubic Feet

(Reprinted by permission from Taylor & Thompson's "Concrete, Plain and Reinforced," page 231)

Proportions by Parts			Proportions by Volumes			Percentages of Voids in Broken Stone or Gravel															
						50%*			45%†			40%‡			30%§			20%§			
Cement	Sand	Stone	Packed Cement	Loose Sand	Loose Stone	Volume of Mortar in Terms of Percentage of Volume of Stone	Cement	Sand	Stone	Cement	Sand	Stone	Cement	Sand	Stone	Cement	Sand	Stone	Cement	Sand	Stone
			bbl.	cu. ft.	cu. ft.		bbl.	cu. yd.	cu. yd.	bbl.	cu. yd.	cu. yd.	bbl.	cu. yd.	cu. yd.	bbl.	cu. yd.	cu. yd.	bbl.	cu. yd.	cu. yd.
1		1	1	3.8	94	5.09	0.72	4.90	0.69	4.73	0.67	4.33	0.61	4.02	0.57	3.85	0.40	3.67	0.38	3.48	0.30
1		2	1	7.6	51	3.67	1.03	3.48	0.98	3.30	0.93	2.93	0.82	2.65	0.75	2.85	0.40	2.73	0.38	2.62	0.37
1		3	1	11.4	36			2.69	1.14	2.54	1.07	2.22	0.94	1.98	0.84	2.34	0.33	2.22	0.30	2.12	0.30
1		4	1	15.2	29							1.78	1.00	1.58	0.89	1.63	0.34	1.52	0.32	1.42	0.30
1		5	1	19.0	25							1.49	1.05	1.31	0.92	1.48	0.34	1.38	0.30	1.28	0.29
1		6	1	22.8	22							1.23	1.08	1.12	0.95	1.23	0.34	1.13	0.30	1.03	0.27
1		7	1	26.6	20									0.98	0.97	1.07	0.38	1.07	0.38	0.97	0.30
1		8	1	30.4	19									0.87	0.98	1.18	0.40	1.18	0.40	1.08	0.33
1		9	1	34.2	18									0.78	0.99	1.28	0.42	1.28	0.42	1.18	0.35
1		10	1	38.0	17									0.71	1.00	1.38	0.44	1.38	0.44	1.28	0.36
1		11	1	41.8	16									0.65	1.01	1.48	0.46	1.48	0.46	1.38	0.38
1		12	1	45.5	15									0.60	1.01	1.58	0.48	1.58	0.48	1.48	0.40
1	1 1/2		1	3.8	5.7	99		3.19	0.45	0.67	3.08	0.43	0.65	2.97	0.42	0.63	2.78	0.39	0.59	2.62	0.37
1	1	2	1	3.8	7.6	75		2.85	0.40	0.80	2.73	0.38	0.77	2.62	0.37	0.74	2.43	0.34	0.68	2.26	0.32
1	1	2 1/2	1	3.8	9.5	61		2.57	0.36	0.90	2.45	0.34	0.86	2.34	0.33	0.82	2.15	0.30	0.76	1.99	0.28
1	1	3	1	3.8	11.4	51		2.34	0.33	0.99	2.22	0.31	0.94	2.12	0.30	0.90	1.93	0.27	0.82	1.77	0.25
1	1 1/2	2	1	5.7	7.6	93		2.49	0.53	0.70	2.40	0.51	0.68	2.31	0.49	0.65	2.16	0.46	0.61	2.03	0.43
1	1 1/2	2 1/2	1	5.7	9.5	76		2.27	0.48	0.80	2.18	0.46	0.77	2.09	0.44	0.74	1.94	0.41	0.68	1.80	0.38
1	1 1/2	3	1	5.7	11.4	64		2.09	0.44	0.88	2.00	0.42	0.84	1.91	0.40	0.81	1.76	0.37	0.74	1.63	0.34
1	1 1/2	3 1/2	1	5.7	13.3	55		1.94	0.41	0.96	1.84	0.39	0.91	1.76	0.37	0.87	1.61	0.34	0.79	1.48	0.31
1	1 1/2	4	1	5.7	15.2	49		1.80	0.38	1.01	1.71	0.36	0.96	1.63	0.34	0.92	1.48	0.31	0.83	1.36	0.29
1	1 1/2	4 1/2	1	5.7	17.1	44		1.69	0.36	1.07	1.60	0.34	1.01	1.51	0.32	0.96	1.37	0.29	0.87	1.25	0.26
1	1 1/2	5	1	5.7	19.0	40		1.59	0.34	1.12	1.50	0.32	1.06	1.42	0.30	1.00	1.28	0.27	0.90	1.17	0.25
1	2	3	1	7.6	11.4	75		1.89	0.53	0.80	1.81	0.51	0.76	1.74	0.49	0.74	1.61	0.45	0.68	1.50	0.42
1	2	3 1/2	1	7.6	13.3	65		1.76	0.49	0.87	1.68	0.47	0.83	1.61	0.45	0.79	1.48	0.42	0.73	1.38	0.39
1	2	4	1	7.6	15.2	57		1.65	0.46	0.93	1.57	0.44	0.88	1.50	0.42	0.84	1.38	0.39	0.78	1.27	0.36
1	2	4 1/2	1	7.6	17.1	51		1.55	0.44	0.98	1.48	0.42	0.94	1.41	0.40	0.89	1.28	0.36	0.81	1.18	0.33
1	2	5	1	7.6	19.0	47		1.47	0.41	1.03	1.39	0.39	0.98	1.32	0.37	0.93	1.20	0.34	0.84	1.10	0.31
1	2	5 1/2	1	7.6	20.9	43		1.39	0.39	1.08	1.31	0.37	1.01	1.25	0.35	0.97	1.13	0.32	0.87	1.03	0.29
1	2	6	1	7.6	22.8	40		1.32	0.37	1.11	1.25	0.35	1.06	1.18	0.33	1.00	1.06	0.30	0.89	0.97	0.27
1	2 1/2	3	1	9.5	11.4	87		1.72	0.61	0.73	1.66	0.58	0.70	1.60	0.56	0.68	1.49	0.52	0.63	1.40	0.49
1	2 1/2	3 1/2	1	9.5	13.3	75		1.62	0.57	0.80	1.55	0.55	0.76	1.49	0.52	0.73	1.38	0.49	0.68	1.29	0.45
1	2 1/2	4	1	9.5	15.2	66		1.52	0.54	0.86	1.46	0.51	0.82	1.40	0.49	0.79	1.29	0.45	0.73	1.19	0.42
1	2 1/2	4 1/2	1	9.5	17.1	60		1.44	0.51	0.91	1.37	0.48	0.87	1.31	0.46	0.83	1.20	0.42	0.76	1.11	0.39
1	2 1/2	5	1	9.5	19.0	54		1.37	0.48	0.96	1.30	0.46	0.92	1.24	0.44	0.87	1.13	0.40	0.80	1.04	0.37
1	2 1/2	5 1/2	1	9.5	20.9	49		1.30	0.46	1.01	1.23	0.43	0.95	1.17	0.41	0.91	1.07	0.38	0.83	0.98	0.34
1	2 1/2	6	1	9.5	22.8	46		1.24	0.44	1.05	1.17	0.41	0.99	1.11	0.39	0.94	1.01	0.36	0.85	0.92	0.32
1	2 1/2	6 1/2	1	9.5	24.7	42		1.18	0.42	1.08	1.12	0.39	1.02	1.06	0.37	0.97	0.96	0.34	0.88	0.88	0.31
1	2 1/2	7	1	9.5	26.6	40		1.13	0.40	1.11	1.07	0.38	1.05	1.01	0.36	0.99	0.91	0.32	0.90	0.83	0.29
1	3	4	1	11.4	15.2	76		1.42	0.60	0.80	1.36	0.57	0.77	1.30	0.55	0.73	1.21	0.51	0.68	1.12	0.47
1	3	4 1/2	1	11.4	17.1	68		1.34	0.57	0.85	1.28	0.54	0.81	1.23	0.52	0.78	1.13	0.48	0.72	1.05	0.44
1	3	5	1	11.4	19.0	61		1.28	0.54	0.90	1.22	0.52	0.86	1.17	0.49	0.82	1.07	0.45	0.75	0.99	0.42
1	3	5 1/2	1	11.4	20.9	56		1.22	0.52	0.94	1.16	0.49	0.90	1.11	0.47	0.86	1.01	0.43	0.78	0.93	0.39
1	3	6	1	11.4	22.8	52		1.16	0.49	0.98	1.11	0.47	0.94	1.05	0.44	0.89	0.96	0.41	0.81	0.88	0.37
1	3	6 1/2	1	11.4	24.7	48		1.12	0.47	1.02	1.06	0.45	0.97	1.01	0.43	0.92	0.92	0.39	0.84	0.84	0.35
1	3	7	1	11.4	26.6	45		1.07	0.45	1.05	1.01	0.43	0.99	0.96	0.40	0.95	0.87	0.37	0.86	0.80	0.34
1	3	7 1/2	1	11.4	28.5	42		1.03	0.44	1.09	0.97	0.41	1.02	0.92	0.39	0.97	0.83	0.35	0.88	0.76	0.32
1	3	8	1	11.4	30.4	40		0.99	0.42	1.11	0.93	0.39	1.05	0.88	0.37	0.99	0.80	0.34	0.90	0.73	0.31
1	4	5	1	15.2	19.0	76		1.13	0.64	0.80	1.08	0.61	0.76	1.04	0.59	0.73	0.96	0.54	0.68	0.90	0.51
1	4	6	1	15.2	22.8	64		1.04	0.59	0.88	0.99	0.56	0.84	0.95	0.54	0.80	0.87	0.49	0.73	0.81	0.46
1	4	7	1	15.2	26.6	55		0.96	0.54	0.95	0.92	0.52	0.91	0.88	0.50	0.87	0.80	0.45	0.79	0.74	0.42
1	4	8	1	15.2	30.4	49		0.90	0.51	1.01	0.85	0.48	0.96	0.81	0.46	0.91	0.74	0.42	0.83	0.68	0.38
1	4	9	1	15.2	34.2	44		0.84	0.47	1.06	0.80	0.45	1.01	0.76	0.43	0.96	0.68	0.38	0.86	0.63	0.35
1	4	10	1	15.2	38.0	40		0.79	0.44	1.11	0.75	0.42	1.06	0.71	0.40	1.00	0.64	0.36	0.90	0.58	0.33
1	5	10	1	19.0	38.0	47		0.73	0.52	1.03	0.69	0.49	0.97	0.66	0.46	0.93	0.60	0.42	0.84	0.55	0.39
1	6	12	1	22.8	45.5	46		0.62	0.52	1.04	0.58	0.49	0.98	0.56	0.47	0.94	0.50	0.42	0.84	0.46	0.39

TABLE No. 17

Quantities of Materials for One Cubic Yard of Rammed Concrete
Based on a Barrel of 4 Cubic Feet

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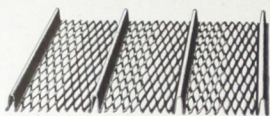
Proportions by Parts			Proportions by Volumes			Percentages of Voids in Broken Stone or Gravel														
						50%*			45%†			40%‡			30%§			20%§		
						Cement			Cement			Cement			Cement			Cement		
						bbl.	cu. yd.	cu. ft.	bbl.	cu. yd.	cu. ft.	bbl.	cu. yd.	cu. ft.	bbl.	cu. yd.	cu. ft.	bbl.	cu. yd.	cu. ft.
Cement	Sand	Stone	Packed Cement	Loose Sand	Loose Stone	Volume of Mortar in Terms of Percentage of Volume of Stone														
1	1	1	1	4	89	4.99	0.46	0.68	2.97	0.44	0.66	2.87	0.42	0.64	2.69	0.40	0.60	2.53	0.38	0.58
1	1	2	1	8	49	3.57	0.41	0.81	2.63	0.39	0.78	2.52	0.37	0.75	2.33	0.34	0.69	2.17	0.32	0.64
1	1	3	1	12	35				2.35	0.35	0.87	2.25	0.33	0.83	2.06	0.31	0.76	1.90	0.28	0.71
1	1	4	1	16	28				2.13	0.32	0.95	2.03	0.30	0.90	1.85	0.27	0.82	1.70	0.25	0.76
1	1	5	1	20	24				2.00	0.30	1.00	1.93	0.29	0.95	1.71	0.27	0.87	1.57	0.24	0.81
1	1	6	1	24	22				1.88	0.28	1.08	1.81	0.27	1.03	1.60	0.26	0.90	1.44	0.23	0.85
1	1	7	1	28	20				1.77	0.27	1.17	1.70	0.26	1.08	1.50	0.25	0.93	1.32	0.22	0.89
1	1	8	1	32	18				1.66	0.26	1.26	1.60	0.25	1.16	1.40	0.24	0.96	1.21	0.21	0.94
1	1	9	1	36	17				1.56	0.25	1.35	1.50	0.24	1.25	1.30	0.23	1.05	1.10	0.20	1.00
1	1	10	1	40	16				1.46	0.24	1.44	1.40	0.23	1.34	1.20	0.22	1.14	1.00	0.19	1.01
1	1	11	1	44	15				1.36	0.23	1.53	1.30	0.22	1.43	1.10	0.21	1.23	0.90	0.18	1.01
1	1	12	1	48	15				1.26	0.22	1.62	1.20	0.21	1.52	1.00	0.20	1.32	0.80	0.17	1.01
1	1	1 1/2	1	4	96	3.08	0.46	0.68	2.97	0.44	0.66	2.87	0.42	0.64	2.69	0.40	0.60	2.53	0.38	0.58
1	1	2 1/2	1	4	73	2.74	0.41	0.81	2.63	0.39	0.78	2.52	0.37	0.75	2.33	0.34	0.69	2.17	0.32	0.64
1	1	3 1/2	1	4	59	2.47	0.37	0.91	2.35	0.35	0.87	2.25	0.33	0.83	2.06	0.31	0.76	1.90	0.28	0.71
1	1	4 1/2	1	4	50	2.25	0.33	1.00	2.13	0.32	0.95	2.03	0.30	0.90	1.85	0.27	0.82	1.70	0.25	0.76
1	1	5 1/2	1	6	82	2.39	0.33	0.71	2.30	0.31	0.68	2.22	0.29	0.66	2.07	0.26	0.61	1.94	0.23	0.58
1	1 1/2	2 1/2	1	6	74	2.18	0.48	0.81	2.09	0.46	0.77	2.01	0.45	0.74	1.86	0.41	0.69	1.73	0.38	0.64
1	1 1/2	3 1/2	1	6	62	2.01	0.45	0.89	1.91	0.42	0.85	1.83	0.41	0.81	1.68	0.37	0.75	1.56	0.35	0.69
1	1 1/2	4 1/2	1	6	54	1.86	0.41	0.96	1.77	0.39	0.92	1.68	0.37	0.87	1.54	0.34	0.80	1.42	0.32	0.74
1	1 1/2	5 1/2	1	6	48	1.73	0.38	1.03	1.64	0.36	0.97	1.56	0.35	0.92	1.42	0.32	0.84	1.30	0.29	0.77
1	1 1/2	6 1/2	1	6	43	1.62	0.36	1.08	1.53	0.34	1.02	1.45	0.32	0.97	1.31	0.29	0.87	1.20	0.27	0.80
1	1 1/2	7 1/2	1	6	39	1.52	0.34	1.13	1.43	0.32	1.06	1.35	0.30	1.00	1.22	0.27	0.90	1.11	0.25	0.82
1	2	3	1	8	74	1.81	0.54	0.80	1.74	0.52	0.77	1.67	0.50	0.74	1.54	0.46	0.68	1.44	0.43	0.64
1	2	3 1/2	1	8	64	1.69	0.50	0.88	1.61	0.48	0.83	1.54	0.46	0.80	1.42	0.42	0.74	1.31	0.39	0.68
1	2	4	1	8	56	1.58	0.47	0.94	1.51	0.45	0.89	1.44	0.43	0.85	1.32	0.39	0.78	1.21	0.36	0.72
1	2	4 1/2	1	8	51	1.49	0.44	0.99	1.41	0.42	0.94	1.34	0.40	0.89	1.23	0.36	0.82	1.13	0.34	0.75
1	2	5	1	8	46	1.40	0.42	1.04	1.33	0.39	0.98	1.26	0.37	0.93	1.15	0.34	0.85	1.05	0.31	0.78
1	2	5 1/2	1	8	42	1.33	0.39	1.08	1.26	0.37	1.03	1.19	0.35	0.97	1.08	0.32	0.88	0.98	0.29	0.80
1	2	6	1	8	39	1.26	0.37	1.12	1.19	0.35	1.06	1.13	0.34	1.00	1.02	0.30	0.91	0.93	0.28	0.83
1	2 1/2	3	1	10	86	1.65	0.61	0.73	1.59	0.59	0.71	1.53	0.57	0.68	1.42	0.52	0.63	1.33	0.49	0.59
1	2 1/2	3 1/2	1	10	75	1.55	0.57	0.80	1.48	0.55	0.77	1.42	0.52	0.74	1.32	0.49	0.68	1.23	0.46	0.64
1	2 1/2	4	1	10	66	1.46	0.54	0.87	1.39	0.51	0.82	1.33	0.49	0.79	1.23	0.46	0.73	1.14	0.42	0.68
1	2 1/2	4 1/2	1	10	59	1.38	0.51	0.92	1.31	0.48	0.87	1.25	0.46	0.83	1.15	0.43	0.77	1.06	0.39	0.71
1	2 1/2	5	1	10	54	1.31	0.48	0.97	1.24	0.46	0.92	1.18	0.44	0.87	1.08	0.40	0.80	0.99	0.37	0.73
1	2 1/2	5 1/2	1	10	49	1.24	0.46	1.01	1.18	0.44	0.96	1.12	0.41	0.91	1.02	0.38	0.83	0.93	0.34	0.76
1	2 1/2	6	1	10	45	1.18	0.44	1.05	1.12	0.41	1.00	1.06	0.39	0.94	0.96	0.36	0.85	0.88	0.33	0.78
1	2 1/2	6 1/2	1	10	42	1.13	0.42	1.09	1.07	0.40	1.03	1.01	0.37	0.97	0.92	0.34	0.89	0.84	0.31	0.81
1	2 1/2	7	1	10	39	1.08	0.40	1.12	1.02	0.38	1.06	0.96	0.36	1.00	0.87	0.32	0.90	0.79	0.29	0.82
1	3	4	1	12	75	1.35	0.60	0.80	1.30	0.58	0.77	1.25	0.56	0.74	1.15	0.51	0.68	1.08	0.48	0.64
1	3	4 1/2	1	12	67	1.28	0.57	0.85	1.23	0.55	0.82	1.18	0.52	0.79	1.08	0.48	0.72	1.01	0.45	0.67
1	3	5	1	12	60	1.22	0.54	0.90	1.16	0.52	0.86	1.11	0.49	0.82	1.02	0.45	0.76	0.94	0.42	0.70
1	3	5 1/2	1	12	55	1.16	0.52	0.95	1.11	0.49	0.90	1.06	0.47	0.86	0.97	0.42	0.79	0.89	0.40	0.72
1	3	6	1	12	50	1.11	0.49	0.99	1.06	0.47	0.94	1.01	0.45	0.90	0.92	0.41	0.82	0.84	0.37	0.75
1	3	6 1/2	1	12	46	1.06	0.47	1.02	1.01	0.45	0.97	0.96	0.43	0.92	0.87	0.39	0.84	0.80	0.36	0.77
1	3	7	1	12	43	1.02	0.45	1.06	0.97	0.43	1.01	0.92	0.41	0.95	0.83	0.37	0.86	0.76	0.34	0.79
1	3	7 1/2	1	12	40	0.98	0.44	1.09	0.93	0.41	1.03	0.88	0.39	0.98	0.79	0.35	0.88	0.73	0.32	0.81
1	3	8	1	12	37	0.94	0.42	1.11	0.89	0.40	1.05	0.84	0.37	1.00	0.76	0.34	0.90	0.69	0.31	0.82
1	4	5	1	16	75	1.08	0.64	0.80	1.03	0.61	0.76	0.99	0.59	0.73	0.92	0.55	0.68	0.86	0.51	0.64
1	4	6	1	16	63	0.99	0.59	0.88	0.95	0.56	0.84	0.91	0.54	0.81	0.83	0.49	0.74	0.77	0.46	0.68
1	4	7	1	16	55	0.92	0.54	0.95	0.88	0.52	0.91	0.83	0.49	0.86	0.76	0.45	0.79	0.70	0.42	0.73
1	4	8	1	16	48	0.86	0.51	1.02	0.81	0.48	0.96	0.77	0.46	0.91	0.70	0.42	0.83	0.64	0.38	0.76
1	4	9	1	16	43	0.80	0.47	1.07	0.76	0.45	1.01	0.72	0.43	0.96	0.65	0.39	0.87	0.60	0.36	0.80
1	4	10	1	16	40	0.75	0.44	1.11	0.71	0.42	1.05	0.67	0.40	0.99	0.61	0.36	0.90	0.55	0.33	0.81
1	5	10	1	20	40	0.70	0.52	1.04	0.66	0.49	0.98	0.63	0.47	0.93	0.57	0.42	0.84	0.52	0.38	0.77
1	6	12	1	24	48	0.59	0.52	1.05	0.56	0.50	1.00	0.53	0.47	0.94	0.48	0.43	0.85	0.44	0.39	0.78

Note—Variations in the fineness of the sand and the compacting of the concrete may affect the quantities by 10 per cent in either direction.

*Use 50 per cent columns for broken stone screened to uniform size. †Use 45 per cent columns for average conditions and for broken stone with dust screened out. ‡Use 40 per cent columns for gravel for mixed stone and gravel. §Use these columns for scientifically graded mixtures.

GF Building Materials

Self-Sentering



Self-Sentering, as its name implies, is a type of expanded metal for concrete reinforcing and miscellaneous fireproofing, which is, in itself, a combined reinforcing and centering—a one-piece steel lath and stud, or furring.

It is made up of a series of heavy, cold-drawn ribs, $\frac{1}{8}$ inch high, always spaced $3\frac{5}{8}$ inches center to center, connected by the most efficient form of expanded metal—all cut and drawn from one sheet of metal.

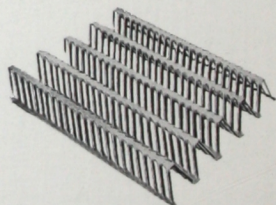
Its heavy ribs are cold-drawn, not stamped, increasing their tensile strength from twenty to forty per cent and their elastic limit from sixty to one hundred per cent. They are made with sides parallel, to give them maximum rigidity, and with a beaded edge at the joining of the expanded metal fabric to stiffen them still further.

The connecting fabric is designed on the only true principle of expanded metal reinforcement. The diamond-shaped meshes diffuse strains from concentrated loads, afford effective continuity of the reinforcement, tend to transfer tensile stresses in the steel to compression in the concrete, and insure that every ounce of metal is in tension. Note there are no breaks at right angles to the line of stress and no metal is wasted to act as mere connecting members. This same mesh affords a perfect mechanical bond for concrete. Roughly speaking, Self-Sentering offers a bonding surface eleven times as great as the same effective sectional area in reinforcing bars. This same mesh also affords an unbreakable key for plaster or mortar.

Self-Sentering finds use in all classes of buildings; for concrete roofs, floors, side walls, ceilings, partitions, columns and beam protection—in industrial buildings, office buildings, warehouses, silos, tanks, garages—such a multitude of uses that it can be fairly classed as a standard for fireproofing reinforcement.

Trussit

Trussit is a corrugated expanded steel sheet, for reinforcing fireproof walls and partitions. The chief advantages for Trussit as a reinforcement of this kind are that it eliminates entirely the use of permanent studing and permits of the erection of partitions but 2 inches in thickness, space saving and wonderfully rigid; curtain walls the equal of brick or poured concrete at practically half their cost.



This material is uniformly expanded in both directions, giving equal strength from either side. It is so interwoven back and forth through the cement or plaster that it is not a mere backing for the wall but an integral part of it. This uniform distribution of the metal also overcomes any tendency toward expansion or contraction in any one general direction, due to changes of temperature, with consequent freedom from expansion cracks.

Herringbone Metal Lath

This lath is the accepted standard wherever metal lath is used. Its rigidity, giving firm plastering surface and allowing wide spacing of studding; its wide sheets; its flat strands, which spread rather than cut the plaster; its perfect key—all combine to make a lath that is most desirable to the owner, architect or contractor.



Style "A" Herringbone Metal Lath shown is recommended particularly for ceilings. Its heavier ribs and smaller openings enable this type to safely carry heavy plaster loads required for ceilings.

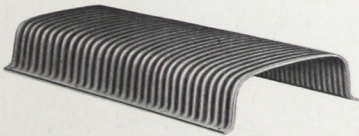
Style "BB"—Used on most work where metal lath is required. Light yet extremely rigid and strong, making it easy and economical to plaster.

Style "AAA"—The ideal general purpose metal lath. It has heavy ribs and wide strands, giving increased rigidity and wide spacing of studs. Equally adaptable for walls and ceilings.

GF Expanded Metal

An ideal reinforcement for floors, roofs, sidewalks, bridges, sewers, conduits, tanks, reservoirs, retaining walls, etc. Easily handled, quickly placed, insures the maximum of reinforcing strength.

GF Steel-Tile



GF Steel-Tile floors, consisting of light steel forms and concrete T-beams, are particularly adaptable to schools, hotels, office buildings, apartments, etc., in fact wherever long floor spans are desired.

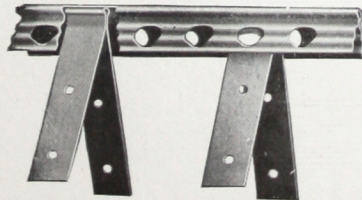
Lighter weight because less material is required, reducing the necessary weight of building walls and foundations as well. This saving and the simple skeleton form work for erecting, make GF Steel-Tile floors very economical.

GF Corner Bead

This bead is so designed that you can get a good thick coat of plaster over the sides and close up to the nose.

And there are enough perforations so that the plaster takes hold firmly and isn't easily cracked off.

GF Corner Bead is ribbed and corrugated to make it stiff and easily handled. Furnished with clip or clipless in 26 and 24 gauge, galvanized.



The GF Building materials described on this page and other products are treated at length in our Fireproofing Hand-Book. A copy will be sent you on request.

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